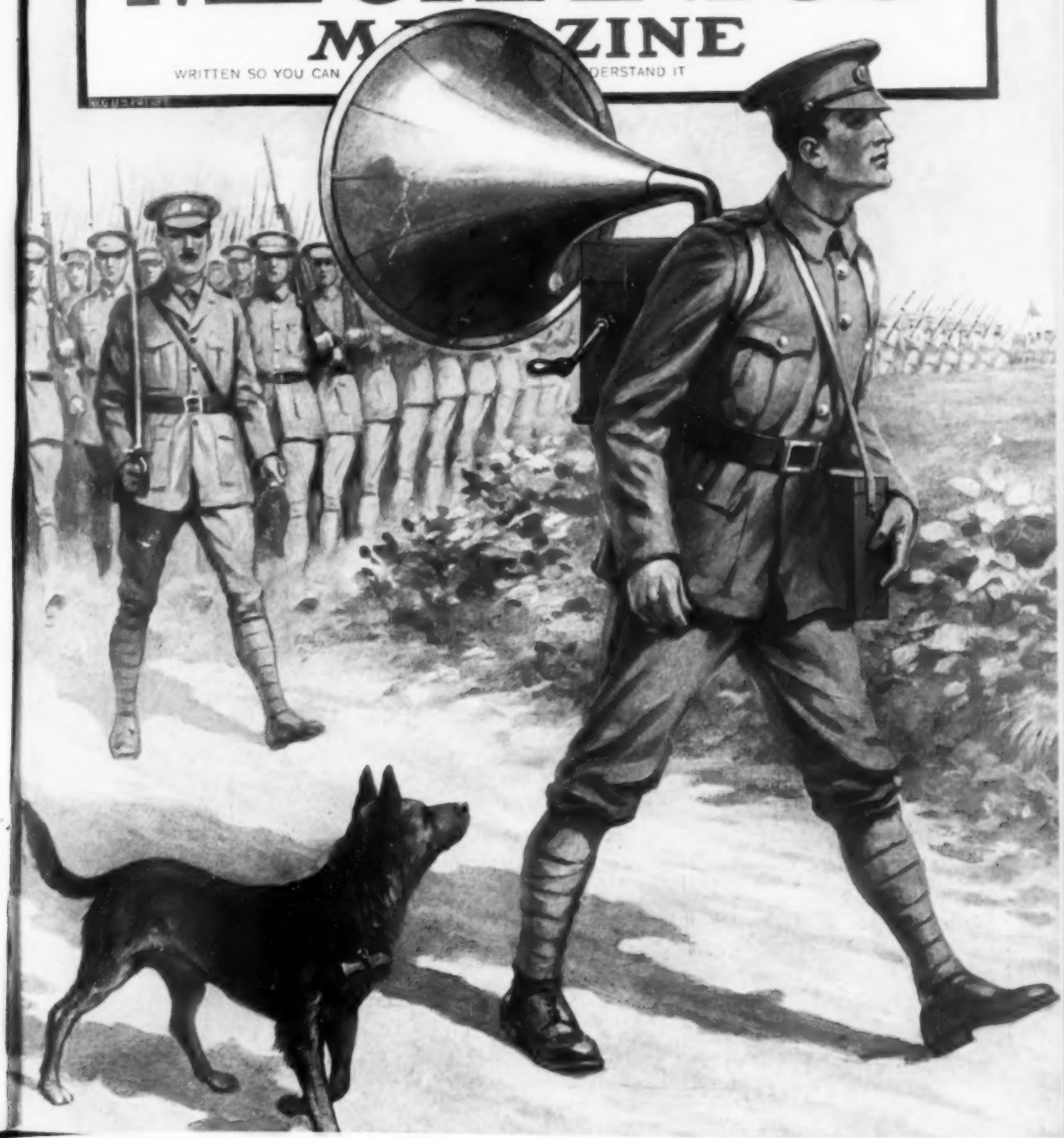
June See Page 847 15 Cents

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



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Popular Mechanics Magazine

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Vol. 27 JUNE, 1917 No. 6

Motor Car Signal Supports Steel Tower

FOR the use of the signal corps in the field, a folding steel observation tower installed upon an armored motor car has been built by two eastern inventors and given a preliminary try-out by military men. It provides a vantage point for a signal officer or observer, and may be used also to carry radio aerials. A small platform, with room for one soldier and a machine gun, is fixed at the top of the mast, which is about 25 feet in height when erected. As constituted at present, no shield is provided to protect the observer from snipers, but such a device could easily be added if use were made of the equipment near enemy lines. One of the outstanding features of the arrangement is that the tower can be transported

Wigwagging from the Top of the Folding Steel Tower: One of the Particular Advantages of the Equipment Is Its Mobility. The Apparatus, as Pictured Here, has been Tried Out by Army Men

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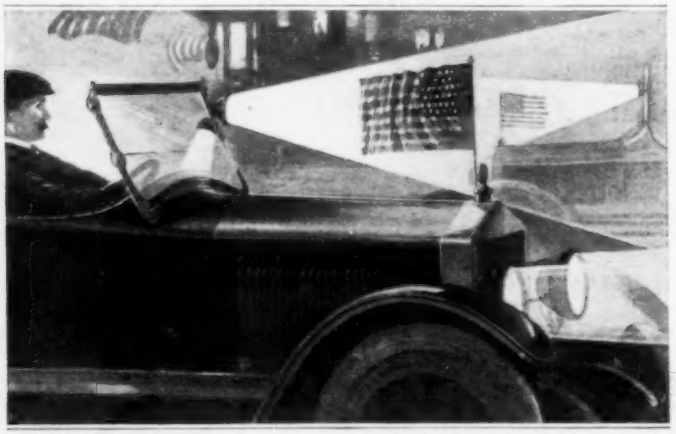
Newsdealers will have the July issue of Popular Mechanics Magazine on sale June 20th.

from one point to another quickly. When it is to be moved, only a moment is required to fold the mast back so that its height is reduced nearly one-half. The tower is of stanch construction, designed to withstand hard usage. When erected, the middle section is locked firmly by a large pin. Two guy wires, and steel braces that may be folded down to the ground on either side of the car, also hold it against movement when observations are being made or signals wigwagged from the elevated platform.

AUTOISTS SHOW FLAGS ON CARS WITH SEARCHLIGHTS

An exceedingly striking method of displaying the United States flag has been adopted by many Los Angeles motorists, each of whom mounts the national emblem on the front of his car and brilliantly illuminates it by means of the automobile searchlight attached to the windshield. As a car so decorated speeds along at night and the flag stiffens in the breeze, all its beautiful details are brought out in sharp contrast to the surrounding darkness. When occasion demands the light can be turned in another direction.



How Motorists Show Their Patriotism at Night: The Flag, Flying in the Stiff Breeze Created by the Movement of the Car, Stands Out Vividly in the Darkness Because of the Searchlight Which is Turned on It

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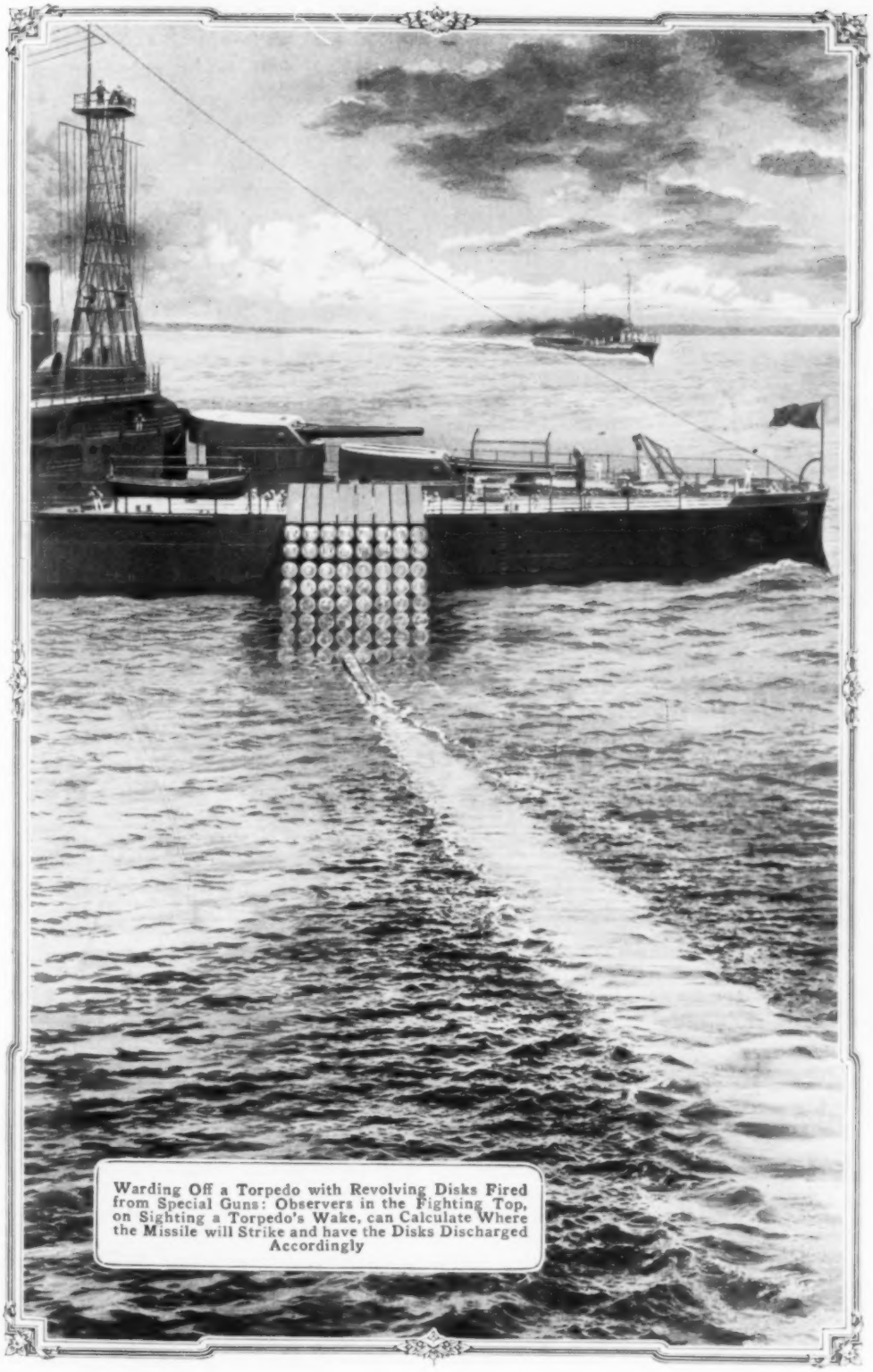
¶In making tests recently with a model of the collier "Neptune," it was found that if that vessel were steaming against a 30-mile wind at 16 miles an hour it would require 770 effective horsepower to overcome the wind resistance, or about 20 per cent of the power necessary to drive the ship through the water.

WHIRLING DISKS TO GUARD SHIPS FROM TORPEDOES

Believing that wire nets and pontoon-supported steel walls are impractical means of defense against torpedoes for moving vessels, an electrical designer in the Norfolk Navy Yard has invented an equipment with which a curtain of slowly sinking steel disks can be discharged in the path of a torpedo. These disks are 24 in. in diameter and constructed with wide rims and air chambers so that they sink slowly. A special type of gun is provided with an electrically operated driving pulley which sets each disk revolving rapidly and then discharges it edgewise into the water, close by the ship, by means of compressed air. A battery of several of these guns, firing as many as 40 of these shields in rapid succession, would construct a slowly sinking wall, or curtain of shields, each of which would remain vertical because of its gyroscopic motion. It is claimed that a trained observer can detect the wake of a torpedo 1,000 ft. or more distant and determine with considerable accuracy where the missile will strike. If, after calculations had been made, several volleys of these shields were properly discharged, an oncoming projectile would collide with one of them and explode without injuring the boat. If the projectile were set to explode at a later time it would tend to push aside the



Warding Off a Torpedo with Revolving Disks Fired from Special Guns: Observers in the Fighting Top, on Sighting a Torpedo's Wake, can Calculate Where the Missile will Strike and have the Disks Discharged Accordingly

disk that it struck and its nose would catch in the rim of the shield. This would direct the torpedo in a circular path, and it would do no harm.

PATENT PHONE DEVICE "HOLDS THE WIRE"

An easily adjusted attachment for desk telephones, lately placed on the market by a Virginia inventor, enables

Telephone Attachment Which Holds the Wire Open with the Receiver on the Hook

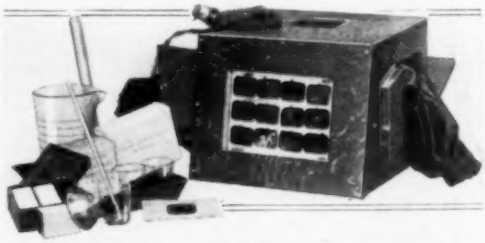
the user to return the telephone receiver to the hook and still "hold the wire." This does away with the necessity of laying the receiver aside on a desk or show case, should the wrong person answer a call, or when data must be looked up before giving a reply. It also enables the phone to be passed from one person to another with one hand, instead of requiring two. The device is used by pushing a button, which slides a spring bolt under the hook, so that the receiver can be hung up without giving any disconnecting signal to "central."

LITTLE THEATER PROSPERS IN MID-WEST TOWN

Those concerned with the advancement of art in the drama will be interested in knowing that Galesburg, an Illinois college town, is supporting its "little theater" in a noteworthy manner. The institution is owned, managed, and directed by local men and women, and in two years has built a substantial foundation for further development. It is fittingly known as the Prairie Playhouse and has become a democratic community enterprise that is backed by the good will of hundreds of citizens. When properties are needed for its stage, they can be obtained from practically any home in the town. Box-office receipts during the theater's first season paid expenses. The past winter, it is inferred, was even more encouraging. The aim of those actively connected with the venture is interesting. The hope is eventually to organize a strong group of players and bring about the dramatization of unwritten stories of life in the upper Mississippi Valley. The plains, fields, mines, and river settlements of the district offer a great wealth of virgin material.

CABINET FOR DEVELOPING X-RAY DENTAL FILMS

A very serviceable developing outfit has been placed on the market by an Indianapolis manufacturer of electrotherapeutic apparatus, which is designed for developing X-ray dental films, or any other small films or plates. It consists of a small wooden case with doors at either end and other necessary openings. The doors give access to black-cloth sleeves through which the photographer inserts his hands to manipulate the films while they are in the acid baths. Combined with the cabinet is a film-illumination and display



Daylight Developing Cabinet and Equipment with Which Dental X-Ray Films or Other Small Films can be Developed with a Minimum of Inconvenience

device by means of which a large number of negatives can be exhibited. The necessary trays, flasks, etc., form a part of the outfit.

Roadside Luncheon with a Convenient Lunch Box on the Running Board of the Family Car: One Side of the Box Lets Down to Form a Table

This Auto Lunch Box Contains Three Patent Hinge Drawers, Two Swinging Drawers, and a Zinc-Lined Ice Box, and is Carried like a Suitcase

CONVENIENT LUNCH BOX FOR THE MOTORIST

An automobile lunch box, designed and manufactured in Portland, Ore., is intended to be carried on the running board of a car, to which it may be attached by means of two small thumbscrews while traveling. It is shaped like a suitcase. One side lets down to form a picnic table, and the box contains a series of hinged and swinging drawers for food and bottles, also a metal-lined ice box with water drain, and a plate and linen compartment. The materials used in construction of the box are fir wood and veneer, the outside being black-enameled and the interior natural finish. Various sizes are made, suitable for from three to eight persons. The largest size is 34 in. long, 19 in. high, and 9 in. deep, the lid making a 15 by 33 in. table.

BRONZE MEDALS PRESENTED TO IOWA GUARDSMEN

Upon their return home from Mexican border duty recently, the Sioux City members of the 2nd Iowa Infantry were presented with bronze medals commemorating their service. The presentation, arranged by leading citizens, took place after a monster parade and home-coming celebration in which 75,000 persons participated.

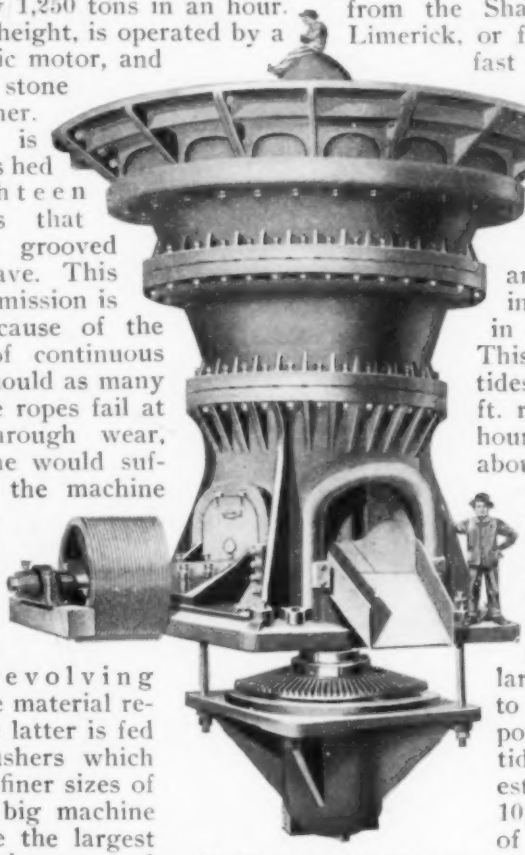
Obverse and Reverse of Bronze Medal Presented to Sioux City Soldiers Returned from Border Duty

PLAN AERIAL PATROL FOR LARGE SHEEP RANCH

FLYING shepherds may add a picturesque touch to life on our western sheep ranges if the plans of a wealthy Montana herdsman prove to be as practicable as they are original. Last season 2,600 of the rancher's sheep wandered into the hills and perished. Therefore he has purchased a biplane and has been receiving instruction at Los Angeles in its operation. He expects to patrol the ranch with the air craft and locate missing flocks. By dropping smoke bombs their positions will be marked. The machine is to be equipped with radio apparatus so as to be in communication with the pack train. If the scheme works out successfully, the rancher contemplates maintaining a flotilla of five or six machines, and it is possible that others of the vicinity will do likewise.

HUGE STONE BREAKER BUILT FOR MICHIGAN COMPANY

Of late a stone crusher of remarkable size and capacity has been installed at a limestone and chemical plant on Lake Huron, near Rogers City, Mich. The machine will hold 65 tons of material at one time and handle approximately 1,250 tons in an hour. It is 34 ft. in height, is operated by a 300-hp. electric motor, and crushes 60-in. stone to 8 in. and finer. The driving is accomplished through eighteen 1¼-in. ropes that pass over a grooved cast-steel sheave. This style of transmission is employed because of the importance of continuous operation. Should as many as half of the ropes fail at any time through wear, the other nine would suffice to keep the machine running. As the stone is broken it is delivered to a belt conveyor and carried to revolving screens. The material rejected by the latter is fed to small crushers which turn out the finer sizes of stone. The big machine is said to be the largest crusher in existence, and is attracting considerable technical attention.

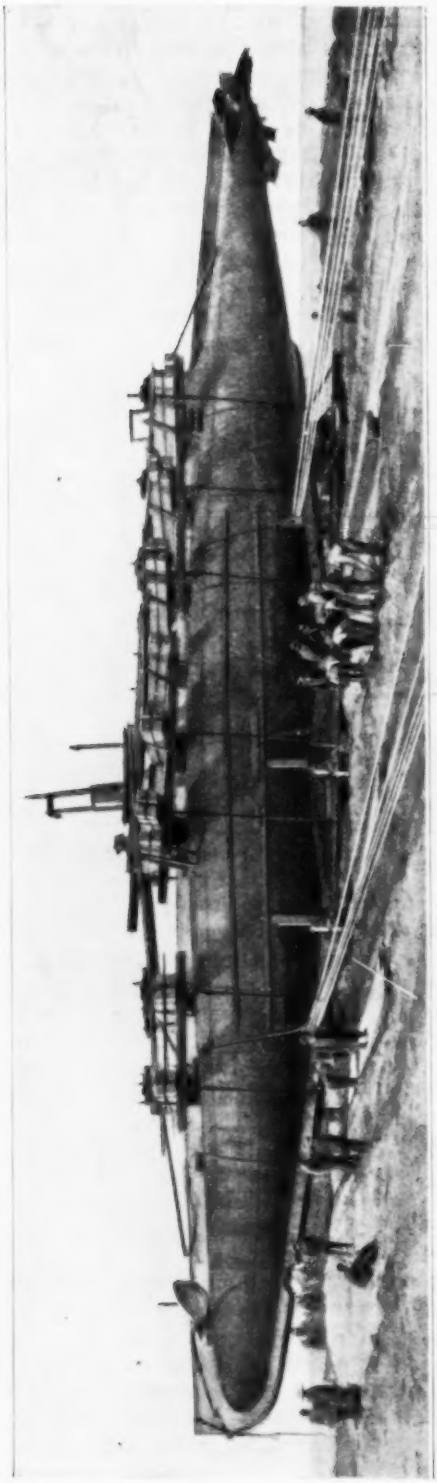


This Giant Machine, Which is Installed at a Michigan Limestone Quarry, is Reported to Be Capable of Crushing 25,000 Tons of Stone in a 20-Hour Day

PLAN TO DEVELOP WATER POWER IN IRELAND

War prices of coal in Ireland, which imports most of its supply, have caused manufacturers and municipalities seriously to consider schemes for obtaining a cheaper electrical supply by developing the water powers of the country. Two principal schemes have been proposed, one to utilize the flow of the rivers Shannon and Erne, while the other would harness the tidal movements of Strangford Lough. The rivers would each, it is believed, furnish 50,000 hp. for eight months of the year and 20,000 to 40,000 hp. for four months, and it would be a simple engineering matter to transmit the power from the Shannon to Dublin and Limerick, or from the Erne to Belfast and Derry. The tidal scheme for Strangford Lough is a different matter. The lough is an east-coast arm of the sea with an area of about 20 square miles and a narrow inlet, varying from ¼ to ½ mile in width for four miles. This channel is swept by tides of from 11½ to 14½-ft. rise, running about six hours each way. There are about two hours of slack water between tides when no power could be developed. Hence, in order to obtain continuous power, storage water reservoirs or storage batteries of large capacity would have to be constructed. The power developed by the tides would vary, it is estimated, from 60,000 to 10,000 hp., or with either of the storage systems suggested, be about 32,000 hp. all the year round. Locks would have to be provided in the inlet channel of the lough, but it is calculated that the scheme could be carried out for an expenditure of about five to six million dollars.

¶ What appears to be one of the largest high-grade salt deposits in the United States was found recently by two men near Lafayette, La., while drilling for oil.



A Most Unusual Moving Job—and a Big One: Salvaging Submarine "H-3," Which Grounded near Eureka, California. Here can be Seen the Cables Which were Placed beneath the Cigar-Shaped Body and Fastened to Beams Laid across the Deck. By Means of Jacks Blocked Up under These Beams the Heavy Craft was Lifted from Its Bed of Sand, and Skids were Placed beneath It. With Block and Tackle the Movers Were Then Able to Draw the Ship Sidewise on Land

HOW WRECKED SUBMARINE WAS RECOVERED

One of the big problems that arose in the salvaging of the submarine "H-3" which grounded near Eureka, Calif., last winter, was how to move the heavy craft. By means of powerful jets of water, channels were bored in the sand under the vessel and cables placed beneath it and fastened to heavy beams laid across the deck. Hydraulic jacks, blocked up so that the cross-beams rested on them, were then employed to raise the submarine out of its cradle of sand. When this had been done skids were placed beneath it and it was slowly hauled away.

ANGLO-INDIAN AEROPLANE ROUTES PROPOSED

Aeroplane service for passengers and mail between England and India was proposed in a public address at Delhi recently, by a titled Englishman who declared his belief that it will be established within the next few years. From Bombay to London by the long sea route is 6,000 miles; by way of Brindisi and Marseille it is 5,000 miles; but the shortest aeroplane route, by way of Russia, would be only 3,600 miles. At the present speed of aeroplanes, mail could be transported to London by this route in less than 36 hours. For passenger traffic, traveling only 10 hours a day at 120 miles an hour and starting from Peshawar, India, it would be entirely practicable to reach London on the third day out. An all-British route of 5,220 miles could also be followed, to be covered in five days. It was estimated that 1,000 passengers could be carried in a week, starting 10 aeroplanes a day, each with 14 passengers and two pilots.

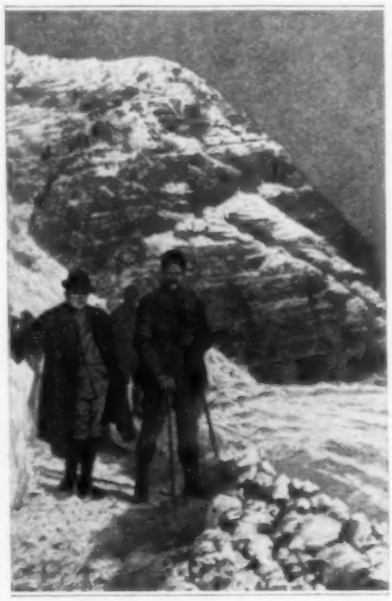
¶The American steamship "Minnesota," whch passed through the Panama Canal last February, was the largest vessel to make the transit up to that time. The ship is 622 ft. long and has a 73-ft. 5-in. beam.

BLOWING UP THE ALPS

By LEWIS R. FREEMAN

IN January of this year, at a time when Alpine travel was exceedingly dangerous because of threatening avalanches, Lewis R. Freeman visited the scene of the most Titanic operations of the great war, carried out by engineers of the Italian forces in the Dolomite Mountains. He tells, in the following article, how it came to pass that, after repeated disappointments, and after days spent poring over reports that told of stupendous feats, a sudden change of weather permitted his visit to the point where the Italian troops were thwarting the Austrians by blowing off the tops of mountains. The story appalls imagination.—Editor.

IT was about the middle of last July that the laconic Italian bulletin recorded, in effect, that the blowing of the top off a certain mountain in the Dolomite region had been accomplished, and that a considerable extension of line had followed. That was about all there was to it, I believe; and yet the wonder engendered by the superb audacity of the thing had haunted me from the first. There was no suggestion of a hint of how it was done, or even why it was done. All that was left to the imagination. The result—in my own case at least—was the awakening of a burning interest in the ways of the warriors who were wont to throw mountain peaks and fragments of glacier at one another as the everyday plains-bred soldier throws hand grenades. My interest finally impelled me to attempt a visit to the Austro-Italian Alpine front at a time of year when the weather conditions threatened to be prohibitive.



Lewis R. Freeman in the Alpine War Zone: The Tall Figure Is Mr. Freeman. The View was Taken near the Front Line on the "Tofana"

"With 25 degrees of frost at sea level in France," observed a French officer at Amiens, "what do you expect to find at 10,000 feet on the Tyrol?"

"A number of things which they don't do at sea level in France or anywhere else," I replied; "but especially *why* they blow the tops off mountain peaks, and *how* they blow the tops off mountain peaks."

Even in Rome and Milan (though there were some who claimed social acquaintance with the Titans who had been conforming Alpine scenery to tactical exigency), they still spoke vaguely of the thing as *fantastico* and *incredibile,* as men might refer to operations in the mountains of the moon.

But once in the *Zona di Guerra,* with every rift in the lowering cloud blanket that so loves to muffle the verdant plain of Venetia in its moist folds revealing evidence that the mountain-top part of the story had at least some foundation of fact, whether the blowing-off part did or not, things took on a different aspect. On my very first day at general headquarters I met officers who claimed to have seen with their own eyes a mountain whose top had been blown off; indeed, they even mentioned the names of the *montagne mutilati,* showed me where they were on the map, pointed out the strategical advantages which had already accrued from taking them, and of those which might be expected to accrue later. They were still there, I was assured, even if their tops had been blown off. They were still held by the Alpini. Two of the most important of them were not so far away; indeed, both would be in plain sight from where we were—if other and nearer mountains did not stand be-

tween, and, of course, if the accursed storm clouds would only lift. And so, at last, the names of the "Castelletto" and "Col di Lano" took sharpened shape as something more than symbols.

"But can I not go and see them?" I asked. "You have told me *why* you blew them up, but not *how;* yet that is the very thing that I came to find out about at first hand."

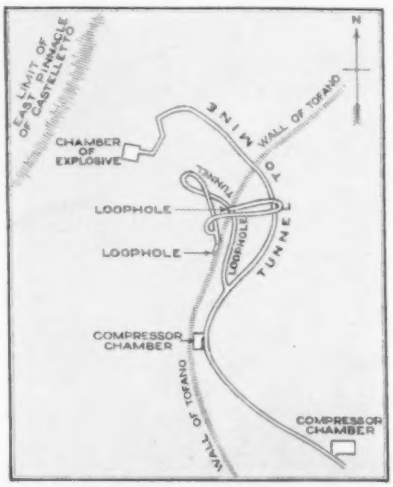
They shook their heads dubiously. "Not while this weather lasts," one of them said. "It has snowed in the Alps every day for over a month. The *valange* (avalanches) are coming down everywhere, and, even if you were willing to risk being buried under one of them, the roads in places will not be open for weeks. You might wait here a month or two, and even then be disappointed so far as getting about on the Alpine front is concerned. Best see what you can of the Isonzo front now and come back for the Alps in the spring."

That seemed to settle it so far as seeing the "Castelletto" and "Col di Lano" were concerned. Regarding the way in which they were mined, however, one of the officers at the *Ufficio Stampa* said that he would endeavor to arrange to have the "Castelletto"—much the greater operation of the two—report put at my disposal, as well as a set of photographs.

"Since you came to Italy on purpose to learn about the mountain whose top was blown off," he said, "the *Comando Supremo* may be moved to make a special dispensation in your favor."

Exclusive permission to make use of both report and photographs was granted me in due time, and since the former makes clear both the why and the how of the unprecedented "Castelletto" operation, it will perhaps be best to summarize it first as a sort of drab background for the more vivid and intimate personal details which a lucky turn of the fitful weather vane made it possible for me to obtain later.

The first part of the report, by the colonel commanding the Alpini group, makes plain why the mining of the "Castelletto" became a *sine qua non* to further progress in this important sector:



LIEUTENANT MALVEZZI'S MAP
Scale 1 : 1,000
(Owing to military exigencies the complete outline of the "Castelletto" cannot be indicated)
The winding tunnel to the left (marked "Loophole Tunnel") was constructed for a passage through which men could advance to occupy the crater formed by the explosion. Its serpentine character was largly due to the fact that it had to keep continually avoiding fissures in the rock through which its location would have been revealed to the enemy. The tunnel to the right is that to the chamber of the mine, and through it all the explosive for the latter was carried.

In the month of October, 1915, I was charged with carrying out an attack with two battalions of Alpini against the positions of "Castelletto" and "Forcella Bois." This was the fourth time, if I am not mistaken, that an attempt on these positions had been made. In spite of the fact that the artillery preparation of the opening day had been excellently performed, I discovered, on the evening of October 17, when I moved with my troops to the attack, that its work had been absolutely of no avail. Having received orders at midnight to proceed to Vervei, where the two battalions above mentioned were to take part in another operation, I was forced to abandon the attack. I am convinced, however, that I would not have succeeded in capturing the "Castelletto" position.

As known, the "Castelletto" is a sort of a spur of the "Tofana" (about 12,000 ft. high), with a balcony shaped like a horseshoe, and with a periphery consisting of numerous jagged peaks. In the rear of the balcony, and within this rocky spur, the enemy had excavated numerous caverns in which machine guns and light artillery pieces, handled by isolated but able gun crews, furnished an invisible and almost impregnable position of defense, giving extraordinary confidence and encouragement to the small forces occupying them. Costeana Valley was accordingly at the mercy of the enemy's offense, and actually cut in two. From Vervei on, all movements of troops had to be carried on only at night and with great difficulty. The conquest of the "Castelletto" was rendered necessary not only for tactical but for moral reasons as well, since our troops came to regard it as absolutely imperative that such an obstacle should be overcome. After completing my observations and researches regarding the "Castelletto" position, I reached the conclusion that the only means of dislodging the enemy therefrom was to blow it up.

On November 19 I formally presented my plan to headquarters, and about the middle of December I was authorized to attempt it. The unusual enterprise was a most difficult one, not only on account of its magnitude, but also on account of the particularly unfavorable conditions of the winter season. Having prepared the necessary material for construction and excavation work, I began, on Jan. 3, 1916, fortifying

The "Castelletto" after the Explosion: The White Dotted Line Shows the Approximate Sky Line of the Peak Blown Off. When One Realizes That This Was a Peak of the Dolomite Alps the Stupendous Nature of the Feat Becomes Apparent

the position (entirely unprotected at the time) from which we would have to work, and completing the construction of the necessary buildings.

Second Lieutenant Malvezzi, in his report on the subject, describes concisely and unostentatiously the development of the work. The accomplishment of the enterprise, considered by many as chimerical, is due not only to the technical ability of Lieutenant Malvezzi, and Lieutenant Tissi, his assistant, but to their special military qualifications as well; also to the courage and good will of the Alpini who, in a very short time, became a personnel of able miners and clever mechanics.

The vicissitudes during more than six months' work, at a distance of only a few meters from the enemy, and under an incessant artillery fire and shelling by *bombarde*, could well form the subject for a book devoted to the study of character. Although fully aware of the attendant dangers, including those of falling rocks due to the countermining of the enemy, the Alpini of the "Castelletto," during the period of more than six months, gave proofs of brilliant valor and unflinching perseverance. They were calm at all times, and moved only by the spirit of duty.

Lieutenant Malvezzi's appended report launched at once into the *how* of the Titanic task which was set for him.

Ladders and Stairs Leading to the Mouth of the Tunnel

On January 3, 1916, work was begun on the approach to "Castelletto," on the "Tofana di Roches" slope, leveling the soil and enabling the construction of lodging quarters for officers and troops. This work required the cutting of about 660 cu. yd. of rock. Next the construction of quarters, and the concealing of them, was quickly accomplished. Finally, there was garrisoned at this post the "Castelletto Detachment," commonly called the "T. K.," consisting of the necessary personnel for labor and the defense of the position.

Our first work was to examine and disclose the enemy lines of communication about the "Castelletto" and "Tofana" sides, and to gain full knowledge of their position in detail. In order to accomplish this, observation points were established which allowed us to carry out such investigation and to make topographical sketches of the zone. Being, as we were, always in the proximity of the enemy, this was a long and fatiguing work. After a month, however, we succeeded in constructing a series of positions at short distances from those of the enemy (from 50 to 150 yards). These were provided with cables and rope ladders to enable us the more rapidly

and easily to study (from all possible points of vantage) the enemy's positions and the development of his works.

From the middle of February to the end of March the tools used for piercing consisted only of mallets and chisels. Our progress was necessarily slow, yet it was sufficient in this time to give us, besides 14 yards of tunnel, room for installing the perforating machinery. At the end of March, notwithstanding heavy snowstorms, the machinery—some pieces of it weighed as much as 1,100 and 1,300 lb.—for beginning work was installed. This was all brought up by hand, and without incident.

The mechanical work was begun on the 2nd of April. We utilized two plants as follows:

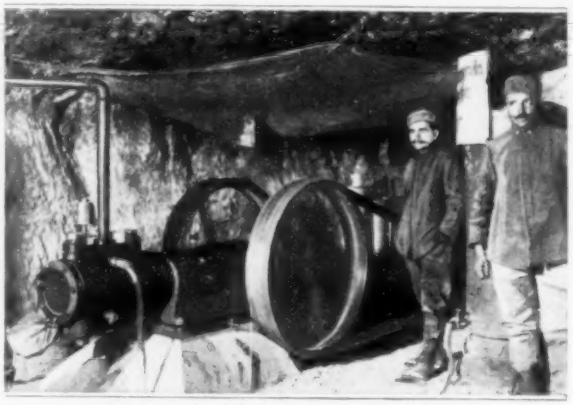
1. A complete group of benzo-compressors, consisting of a 30 to 40-hp. kerosene motor adjusted to a compressor by means of a belt. This machinery was installed, on a solid base of cement, at the beginning of the tunnel, in a 16 by 28-ft. space dug out in the side of the mountain for that purpose.

2. Another compressor mounted on a four-wheel truck.

Both machines were of American manufacture, and gave complete satisfaction at all times. Each compressed the air to a density of about seven atmospheres, injecting it into an air chamber, whence, by means of a rigid tube, ending in one of flexible rubber, it was conveyed to the respective drills.

Four squads worked at a time, each one consisting of a foreman and from 25 to 30 miners. Each squad worked six hours without interruption. This rate, apparently light, was found, on the contrary, to be very heavy, owing principally to the development of nitric gases which poisoned the air, and to the dust caused by the drills.

The "motorists" (mechanicians in charge of the engines) were divided into two groups, one for each compressor. Each group was directly under a chief engineer. A motorist would alternate with an assistant, each working eight hours. Adjacent to each engine was posted a table containing regulations in detail as to the work to be performed, the upkeep of the machinery, and the responsibility of the personnel.



One of the Air Compressors in a Chamber of the Tunnel: The Two Italian Engineers Are of the Enduring Type That Made the Feat Possible

At first the only explosive used was military gelatin; later, dynamite-gelatin. The system of overcharging the holes was always adopted, in order to reduce the débris to minute particles, easier to be transported and unloaded. The work was carried on in sections, varying from about six by six feet to one-half foot or more larger. The flat stretches of the tunnel were laid with rails. All material was carried out in cars and dumped into a hopper discharging into a large pipe. (The dump was accumulated at a point beyond the observation of the Austrians.) The average rate of progress was about 17 feet per day.

(It may be well to explain here that it was not possible to begin tunneling on the same level at which the mine was to be exploded, but considerable more than 150 feet below that level. The tunnel had, therefore, to be driven on a steep gradient. Another point which the report does not make clear should be borne in mind, viz., that the tunnel divided in the heart of the "Castelletto," the main bore being driven on to where the mine was to be exploded, while a smaller branch—referred to below as the "Loophole Tunnel"—was run up to a point where favorable exit could be obtained for charging into and occupying the crater of the exploded mine. In all 1,663 ft. of tunnel had to be driven, involving the excavation of 2,200 cu. yd. of rock.)

It was originally intended to divide the explosive charge between two chambers, each having a mining line of resistance of about 66 feet with a 16-ton explosive charge of 92-per-cent gelatin. However, owing to the countermining work carried on by the enemy—we were only a few yards from one of his positions during the charging of the mine chamber—we were obliged to confine the entire charge to a single chamber.

The enemy, meanwhile, with a view to avoiding the effects of our mine beneath the peaks of the "Castelletto," had transferred most of his shelters to the side of the "Tofana" and the "Selletta." This necessitated a considerable alteration in the location of the mine as originally planned, in order that it should act against the enemy shelters on both the "Castelletto" and "Tofana" flanks.

The charge was computed on a basis of minimum resistance of about 66 feet, taking into consideration the nature of the rock (which was fissured) and the existence of numerous splits and caverns. The coefficient of overcharge was, therefore, rather high. In order to obtain the maximum effect under these conditions, only 92-per-cent explosive nitroglycerin was used. The total charge was 35 tons.

The method of priming adopted was suggested by Lieutenant Colonel Tatoli, of the Engineers' Corps. This consisted of five priming groups, each of three friction tubes. One of the groups ran along the central axis of the chamber, while the other four, parallel with the first, were disposed symmetrically facing the four corners of the chamber. Each tube (1¼ in. in inside diameter, by about 15 feet in length) was alternately charged with gelatin and guncotton and pierced by picric acid detonating fuse, ending in a guncotton cartridge with electric percussion cap. In the very center of the charge there were inserted two cases of guncotton, with electric percussion cap and detonating fuse, with a view to securing a second springing of the mine to follow the first.

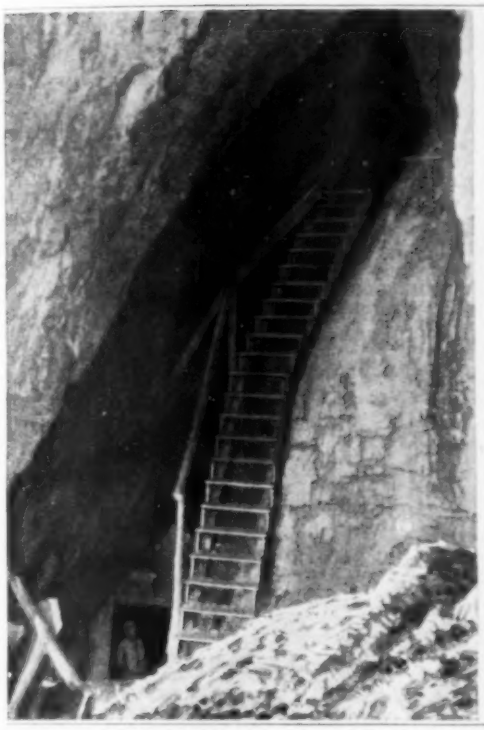
We thus had in all 17 electric circuits divided into three groups, each formed by the circuits of five tubes, connected with the five groups of friction tubes. Two of these electric groups were composed of six circuits each, by adding the two circuits of the above-mentioned cases containing the guncotton. Each of these electric groups ended with an exploder, placed at a distance of about 15 feet from the mine chamber.

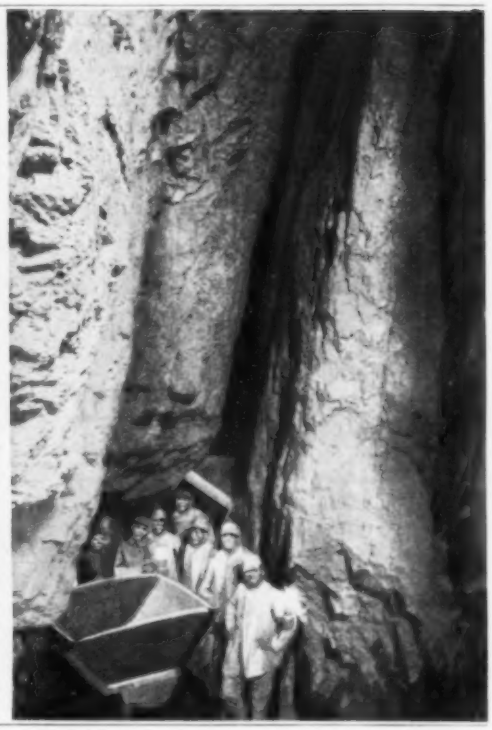
The tamping was effected with cement and with sandbags, with heavy wooden beams between the latter. It was made more effective by dividing into sections at right angles to each other. The theoretical length of the tamping was about 80 feet.

The charging of the mine chamber began July 3, 1916, at 5 p. m., and was completed at 3 p. m. of July 9, this work including tamping, priming, and laying of electric circuits. The final connections between the latter and the exploders, by means of wires suspended in the air, were made on July 10. The mine was sprung on the 11th of July, at 3:30 p. m., and responded fully to our calculations and expectations.

(Signed) Ing. L. Malvezzi,

2nd Lieut. 7th Regiment Alpini.





Left: Portion of Stairway inside the Tunnel. Much of the Tunnel was Driven on a Gradient of Over 45 Degrees. All of the Explosive and Much Material had to be Carried up This Stairway on the Backs of Men. Right: Natural Fissure in the "Castelletto" Encountered by the Tunnel of the Mine. Fumes Rising through a Similar Fissure Gave the Italians Warning of the Direction of an Austrian Countermine

A week of unspeakable weather went by—an interval the days of which I spent among the "cavemen" of the Carso, and the nights of which were largely devoted to puzzling through the mysteries of the "Castelletto" report with the aid of my Italian dictionary—and then the unexpected happened. Rain and snow ceased, the sky cleared, and a spell of sparkling days succeeded the interminable months of storm and lowering clouds. From the high Alps came word that the grip of the frost had paralyzed the avalanches for the moment, and that rapid progress was being made in opening up the roads for traffic.

"Now is your chance to see the 'Castelletto,'" they told me at headquarters. "If you start at once you ought to be able to get through without much trouble; and, if the weather holds good, you may even be able to get back without long delay, though you'll have to take your chances."

And so it chanced that on a diamond-bright morning in early January I found myself, after a couple of days of strenuous motoring, speeding in a military car past the old customhouse and up into the heart of that most weirdly grand of all Alpine regions, the Dolomites. Already we were well over into what had once been Austrian territory, and the splintered pinnacles which notched the sky line ahead of us were, as my escorting officer explained, held in part by both the Italians and the enemy. As we coasted down into "Cortina di Ampezzo" Captain X—— pointed to where a clean-lined wall of snow-capped yellow rock reared itself against the deep purple of the western sky.

"That high mountain ridge is the Tofana *massif*," he said, "and that partly isolated mass of lighter-colored rock (crowned with towers like a medieval stronghold), at its farther end, is what is left of the famous 'Cas-

telletto.' It is twenty kilometers (about 12 miles) or more away, but you can see even from here how it dominated the valley and road, the latter the much-pictured Dolomite road, which is also a route of great military importance. Now look at the end of the 'Castelletto' toward the wall of the 'Tofana.' Do you see where it seems to have been sliced off smoothly at an angle of about forty-five degrees? Well, that is the part they blew off last July. Up to then that end, like the other, was crowned with a lofty spire. That spire, the base from which it sprung, the Austrian barracks and munition depots, together with the men stationed there—all were blown up and destroyed in the explosion. Take a good look at it while you have a chance, for the sky-line view is better from a distance than from close at hand, where we shall go this afternoon if the way is open. To see the effect of the explosion at its best," he added, "one should look at it from the Austrian lines, as it was the blowing out of the other side of the mountain which undermined and let down the top."

Viewed even from a distance of a dozen miles or more, the alteration wrought in the sky line by the explosion was not difficult to imagine. It was indeed literally true—what I had never been fully able to make myself believe until that moment—that a mountain peak had been blown off—hundreds of feet of it, and thousands of tons.

It was not until, after ten miles of precarious climbing and clawing up the ice-paved snow-walled road, our car brought up in the midst of a neat little group of Alpine buildings, nestling in the protection of the last of the timber, that Captain X—— revealed the surprise that had been prepared for me there.

"Our host here," he said, "will be Colonel Y——, who conceived and directed the 'Castelletto' project, and at dinner tonight you will meet, and can talk as long as you like with, Lieutenant Malvezzi, who did the work. He is still quartered here, and will be glad to tell you all that he can about Alpine military engineering. We have already sent him word that you came to Italy expressly to see him."

After a hasty lunch Captain X—— and I, accompanied by an officer of Alpini from the camp, started for the "Castelletto." Our powerful military car which, in spite of the fact that it had nonskid tires, had been giving a good deal of trouble on the ice, was left behind, and a smaller but heavily engined machine, with sharp spikes clamped over the rims to grip the glassy surface of the road, was taken for the few miles of the latter which were still open. Abandoning this in a snow bank at a little advanced camp well up under the towering wall of the 'Tofana,' we took our alpenstocks and started on the 2,000-ft. climb up to the base of the "Castelletto." The hard-packed snow on the thirty to forty-degree slope must have averaged from ten to twenty feet deep all the way, while, for a half mile or so midway, it was humped up in crumpled folds where, a fortnight before, one of the largest and most terrible slides ever known in the Alps had plunged down on its sinister mission to the bottom of the valley. The full story of that avalanche will hardly be told until after the war.

Slightly softened by the brilliant sun, the snow gave good footing; but even so it was a stiff pull to the little ice and rock-begirt barracks at the base of the cliff, and I gained some idea of the Titanic labor involved in getting guns, munitions, machinery, food, and 35 tons of high explosive up there, all by hand, in every sort of weather, and much of it (to avoid enemy observation and fire) at night.

Midwinter was not, of course, the time to see anything of the real effects of the great explosion, for the huge crater torn by the latter was drifted full of snow, and snow was also responsible for the complete obliteration of the countless thousands of tons of débris that had been precipitated down the mountain side. A dizzy climb up the ladderlike stairway, and a crawling

Portion of the "Castelletto" Crater Formed by the Mine Which the Italian Engineers Exploded from Their Tunnel Far Below

clamber through a hundred yards of the winding tunnel from the rock chambers which had housed the compressors, revealed about all that was visible at the time of the preparations and consequences of the mighty work; but a peep from the observation port of a certain cunningly concealed gun cavern discovered a panorama which gave illuminative point to the concluding words of the artillery officer who, pointing with the shod handle of an ice pick, explained the situation to me.

"So you see," he finished, "that the 'Castelletto' in the enemy's hands was a stone wall which effectually barred our further progress; while in our hands it becomes a lever which—whenever we really need to take them—will pry open for us positions of vital importance. We simply *had* to have it; and so we took it in the one way it could be taken."

Save for his Alpini uniform, Lieutenant Malvezzi, when I met him at dinner that evening, might well have passed for the typical musician of drama or romance. His skin and hair and eyes were dark, and his long nervous fingers flitted over the paper on which he sketched various phases of the "Castelletto" work very much as those of a pianist flit above his ivory keys. The dreamy far-away look in his eyes was also suggestive of the musician, but that I had long come to recognize as equally characteristic of all great engineers, the men whose tangible achievements are only the fruition of days and nights of dreaming.

"Where shall I begin the story?" he had asked as the diners in the regimental mess began to resolve into little knots of threes and fours over coffee and cigars; and I had suggested that he take it up where his report left off. "That stopped just as things began to happen," I said. "Now tell what *did* happen."

The *tenente* laughed a laugh suggestive of rueful reminiscence, and a smile ran round among those of the officers who had heard and understood

my words. "So far as I am concerned," he replied, "that covers about five minutes of activity; five minutes for which we had been preparing for six months. You understand that we had constructed a branch tunnel through which our men were to rush and occupy the crater as soon after the explosion as possible. *Ecco!* The men were all massed ready on and under the terrace, and nothing remained but the making of the connection firing the mine. I took one long look around and then threw over the electric switch closing the circuit. Every one seemed to be holding his breath as he waited. One, two, three seconds passed, in a silence so intense that I heard the sharp 'ping' of the water dripping from the roof of the chamber and striking the pool it had formed below. Then, before any other sound was audible, the whole mountain gave a quick convulsive jerk, strong enough to throw some of the men off their feet. A heavy grinding rumble in the earth came with a shivering that followed the jerk, but the real roar of the explosion (from the outside) was not audible for a second or two later. Only those watching from a distance of several kilometers saw the right-hand pinnacle of the 'Castelletto' give a sudden heave, and then sink out of sight in a cloud of dust and smoke.

"In addition to the honor of firing the mine, that of leading my men into the crater had also been reserved for me, and as soon as I heard the roar of the explosion I gave the order for them to follow me up into the tunnel. Well—" he paused and ran his laughing eyes around the grinning circle of his fellow officers—"that is about as far as my evidence is good for anything. As I went clambering up the slippery steps of the tunnel, an almost solid wall of choking fumes struck me in the face, and I—and all of my men except those near or outside of the portal—dropped coughing in my tracks."

"Had the mine blown back through the tamping?" I asked.

"Not exactly," he replied, his rueful smile becoming almost sheepish, as of one who had allowed himself to become the victim of a prank. "The Austrians had a big store of asphyxiating bombs on hand to use against us, and these, exploded by our mine, vented their spite on friend and foe alike. We were not able to occupy the crater for twenty-four hours. I am glad to say that I spent what would otherwise have been an intolerably anxious interval unconscious in the hospital. By the time I had been revived a friendly breeze had thinned the gas sufficiently to allow our Alpini to move into the crater and reap—in spite of the delay—every advantage we had at any time counted upon from the operation. Our most cherished capture was the 'perforator'—practically intact—with which the Austrians were driving an almost completed countermine directly under us."

"The nervous tension must have been rather strong toward the end, wasn't it?" I asked. "Especially when you knew the enemy had at last got your work definitely located and was rushing his countermine?"

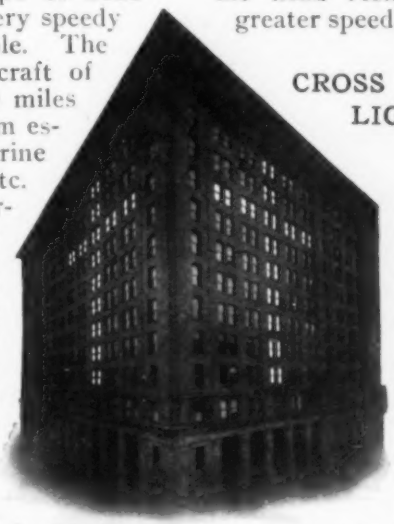
The smile of whimsical ruefulness died out of the dark sensitive face, leaving behind it lines I had not noticed before, lines that only come on young faces after weeks or months of incessant anxiety. The backward-cast shadows of a time of terrible memory were lurking behind his eyes as he replied:

"For seven days and nights before the mine was sprung neither I nor the officers working with me slept or even rested from work."

That was all he said; but I saw the eyes—brimming with ready sympathy—of his fellow officers turn to where he sat, and knew the time for light questionings was past. Not until that moment did a full appreciation of the travail involved in the blowing up of the "Castelletto" sink home to me, and I nodded fervent assent to the words of the English-educated captain of Alpini next me when he observed that "Malvezzi's little Order of Savoy was jolly well earned, eh?"

SPEED AND SAFETY SOUGHT IN SHIP OF NEW TYPE

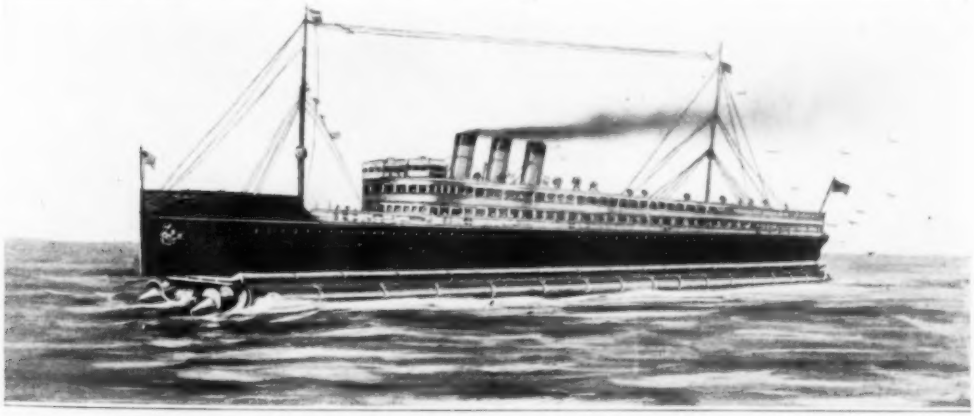
There was recently exhibited in Portland, Ore., an electrically driven 7-ft. model of an original type of boat which is designed to be very speedy and practically unsinkable. The inventor estimates that craft of this type could travel 50 miles an hour, thus making them especially suited for submarine chasing, life-saving, etc. This boat rides on two parallel air-tight cylinders laid some distance apart and divided by bulkheads into sections, which in the case of large ships would be used for storage. Lining the bottom of the hull proper, which rests on these cylinders, are hollow metal pontoons, normally just above the water, while on either side of the ship above the principal floats are other pontoons. These supplementary floats aid in righting the ship when it rolls and prevent it from sinking in case the others give out. The propellers are driven by a shaft that lies between the two large cylinders and therefore operate in water undisturbed by the progress of the vessel—an arrangement designed to give them additional effectiveness. The front ends of the two big floats are cone-shaped and are provided with flanges. The function of these cones, which revolve, is to eliminate the head resistance, thus making greater speed possible.



Window Lights Arranged to Show Cross on Either Side of an Office Building on Good Friday Night

CROSS OF BUILDING LIGHTS FOR GOOD FRIDAY

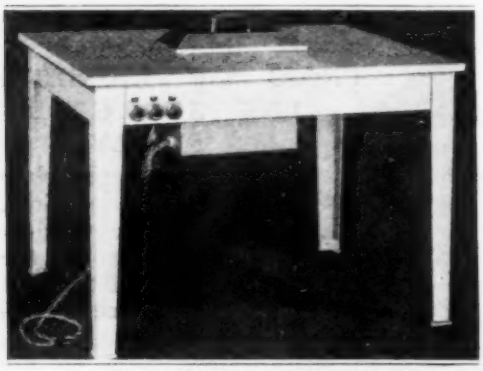
As an appropriate observance of Good Friday, the window lighting of the Northern Pacific general-office building at St. Paul, Minn., was so arranged as to form an illuminated cross on each of the two fronts. This was done by turning on the electric lights in certain rooms of the building and lowering the shades of all other windows to make the cross lights stand out. The result was a cross visible at night for a considerable distance. The complete set of electric switches installed in the building aided greatly in securing the unusual effect, which required lights on nine of the floors.



New Type of Speedy Vessel Designed by an Oregon Inventor: The Craft Rests on Two Large Air-Tight Cylinders Having Revolving Heads That Supplement Propellers Located between the Two Pontoons

CHOCOLATE-COATING TABLE WITH ELECTRIC HEAT

The chocolates displayed in tempting array by the confectioner in store



Electric Table Used by Candy Makers for Coating Chocolates: There Are Three Heating Units beneath the Container

window or show case are usually coated by hand, and an up-to-date chocolate coater's working table is an interesting piece of industrial furniture. In its latest form it is an electric table, with marble top mounted on a white-enameled steel frame, easy to clean. In the center of the top is a galvanized-iron container with a capacity of about 30 pounds of chocolate. Under this are three electric heaters, controlled by separate switches, by which the chocolate is melted and kept at the proper temperature for working.

HUGE COAL PIER LOADS WITH BELT CONVEYORS

A $2,500,000 coal pier that can load 7,000 tons of coal an hour has been opened by the Baltimore and Ohio Railroad at Curtis Bay, near Baltimore. The structure is of unusual interest because of its capacity, which is claimed to be the largest of any coal pier yet constructed, and because it handles coal by belt conveyors instead of by gravity. This arrangement greatly reduces the breakage by making 3 ft. the maximum fall for coal from the time it leaves the car until it reaches the ship. At the land end of the pier, which is of concrete and steel, are two car dumpers and next to them are balancing bins into which certain of the belt conveyors empty. On the pier are four traveling loading towers that can serve as many ships, all at one time. They are

New Coal Pier near Baltimore Which Has a Capacity of 7,000 Tons per Hour: With the Four Loading Towers Vessels with Bunker and

supplied with coal by 60-in. belts having a maximum speed of 500 ft. per minute. Supplementing these are two towers that trim the ships' loads. The functions of the entire plant are interlocked and controlled electrically by push buttons.

PRIVATE WEATHER RECORDS AID IN SETTLING CLAIMS

Authentic data regarding the weather are so important a factor in determining the justness of certain kinds of claims for damages that some large corporations maintain stations on their own property which supply them with records regarding the weather throughout the year. An example of an establishment of this sort is the station belonging to a smelting company near Salt Lake City, equipped to record automatically the velocity and direction of the wind, the temperature, rainfall, and humidity. These facts are valuable in settling claims for damage to crops and live stock, alleged to have been caused by smelter fumes that spread over near-by land. Many railroads keep weather records which help them check up on claims for damage to freight caused by cold or rain.

Weather Station Maintained by a Western Smelting Company: Here Records are Kept Which Often Aid in Determining the Justness of Claims Based on Alleged Damage to Near-By Property

¶The French government is contemplating the placing of an order in this country for 20,000 and possibly 40,000 railway cars.

Shown Here, and Two Trimming Towers, That do Not Appear in This Picture, It Is Possible to Load Four Cargo Coal Simultaneously

FOOT AUTOS USED IN POSTAL DELIVERY SERVICE

Experiments made recently by the postmaster of Washington, D. C., have shown that small wheeled motors with a low platform on which the rider stands, can be successfully used in the special-delivery service. Five out of a force of 50 messengers were equipped with these machines, and the experience of the first three weeks of their use tended to prove their efficiency. The little motors cost less than $100 apiece, and are reported to have given good service at the capital during the storms of the late winter.

PHOTO BY HARRIS & EWING

Special-Delivery Messengers of the Washington Post Office, Equipped with Foot Autos Which Did Good Service in a Recent Test

ACETYLENE GENERATOR HAS AUTOMATIC FEED

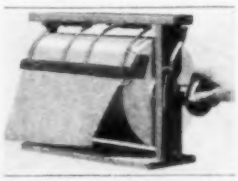
An acetylene generator of recent English design is furnished with two generating chambers, one of which acts as a reserve. Only one is in operation at a time, and as it becomes exhausted the other is automatically switched into service, leaving the first free to be recharged and set so as to be automatically brought into action in its turn. Thus a continuous supply of gas is provided, there being no need of interruption when the carbide in either chamber has to be replenished. Carbide in any size can be used.

AMERICAN GLASS LEADING IN CHINESE TRADE

Most of the window glass imported into China at present is of American manufacture, instead of being the product of Belgian glassworks, as before the war. The United States also supplies the larger part of the plate-glass imports, and would supply practically all of both grades of glass, according to our consul general at Hongkong, if freight rates from this country were adjusted to meet those from Great Britain. Large stocks of Belgian and British window glass were on hand in Hongkong warehouses when the war came, and it took a year or more to deplete these stocks and open the market for American glass, which was sent to China in large quantities in 1916.

WRAPPING PAPER UNROLLED EASILY WITH NEW RACK

An improved rack has been patented by means of which wrapping paper can be unrolled with one hand, while by the same operation the torn edge of the paper is drawn away from the roll to which it tends to cling, so that the other hand can grasp it easily. The paper is unrolled by turning a knob on the end of the shaft on which the roll is mounted. By sliding this knob inward on the shaft a set of levers is operated which throws an arm between the roll and the torn edge of the paper, so that the latter can be taken hold of conveniently without rubbing the hand on the roll or crumpling the end.



CENTRAL HEATING PLANT FOR CITY BUILDINGS

Above, a Lone Workman is Shown at the Top of the Stacks, Swinging from a Big Derrick Boom Hundreds of Feet above the Ground. Each of the 12-Foot Chimneys, Comprising the Battery Pictured at the Right, Extends 325 Feet in Height

Several of the Big Office Buildings in the Financial District of New York are to be Heated and Supplied with Power from a Central Station That Is Now in the Course of Completion. The Plant Occupies a Four-Story Structure That Is 150 Feet in Height, and Contains Rows of Large Boilers Which will Require a Daily Consumption of About 900 Tons of Coal. It Represents an Investment of Approximately $1,500,000

The Firing Line Is but One Place Where Cool Heads and Abundance of Nerve are Needed. Hundreds of American Structural Workers Demonstrate Capability and Fearlessness Daily While about Their Work, Which More Often than Not Is Hazardous. The Picture at the Left, for Instance, Shows Two Men, More than 300 Feet above the Earth, Who Are Completely at Ease Where Most Folks would Be as Limp as Rags with "Seasickness"

PHOTOS COPYRIGHT INTERNATIONAL FILM SERVICE

EVER-CHANGING COLORS LIGHT NEW AQUARIUM

A new type of aquarium is provided with concealed electric lights which beautifully illuminate it with constantly changing combinations of color, making it a most attractive article for the home. The bowl, which is of clear glass and is hand-decorated, rests on a woven-reed base in which are installed electric bulbs, each of a different color. Each light is controlled by a separate thermo-switch so that it flashes intermittently. By this means the aquarium is suffused with hues that are constantly changing, the variety being increased by the fact that no two switches operate in unison.

Colored Electric Lights are Concealed in the Base of This Aquarium. Each is Controlled by a Separate Thermo-Switch and Flashes Intermittently, Suffusing the Water with a Constantly Changing Variety of Colors

AEROPLANE ENGINE TESTED WITH A MOTOR TRUCK

In testing an aeroplane engine of 200 hp., a Detroit company recently mounted it upon a heavy motor truck and the aerial propeller sent the truck flying along a boulevard at the rate of over 40 miles an hour. This was a speed that the truck could not begin to develop under its own motor power, and the method furnished a better practical test of the 12-cyl. aeroplane engine than was possible in the testing laboratory, or in any stationary trial on blocks. As an additional test, the rear wheels of the two-ton truck were locked, so that they could not revolve, and in this condition it was driven across a ball park by the aeroplane engine and propeller, through heavy drifts of snow and over ice. The motor weighs 800 lb. and develops power sufficient to drive a 12-passenger aeroplane at 40 miles an hour.

Aeroplane Engine and Propeller Mounted for a Test on a Motor Truck: The 12-Cylinder Engine Developed 200 Horsepower and Drove the Heavy Truck at a Speed of Over 40 Miles an Hour

Company House being Moved from Camp Stewart to El Paso, Texas, on Motor Trucks: One was Placed under Each Corner, and the Rear Trucks Ran Backward the Distance of Nearly Eight Miles

MOTOR TRUCKS MOVE HOUSE ACROSS COUNTRY

With the departure of the National Guard from the Mexican border this spring, it became necessary to move one of the company houses from Camp Stewart to the motor-truck park at El Paso, Tex., a distance of 7½ miles. The building was 46 ft. long by 20 ft. wide, and ordinary methods of house moving could not be used, as it was not feasible to transport the building over the roads, because of trees, wires, and other obstructions. The difficulties vanished when four motor trucks were employed, one under each corner of the house. Then with the two rear trucks driving backward, on reverse gear, the trip was made across country, through gullies and ditches, in less than two hours.

BIG COLLIE IS CHAUFFEUR OF MASTER'S MOTOR CAR

Gear-shifting, of course, is outside the limits of possibility for him, but except for this operation a big collie, owned by a Poughkeepsie, N. Y., automobile dealer, is able to drive a motor car. Everybody along "auto row" in New York City was completely dumfounded not long ago when the dog acted as chauffeur for his master. While weaving in and out through Broadway's traffic, however, the owner had an auxiliary control at hand to help the animal out of tight places and avoid the danger of a mishap. But on ordinary occasions when congested streets do not have to be negotiated, the collie drives along like a man, turning corners and avoiding other vehicles with surprising facility. On such rides his master sits beside him, or in the tonneau behind. On a track, where the chance of accident is eliminated, the dog drives alone with nobody in the car to help him. No special device is fixed to the steering wheel to assist him.

New Yorkers Stood Aghast Not Long Ago When This Dog Drove His Master down Broadway

¶ The progressiveness of the Japanese is well illustrated by the fact that at Port Arthur, Manchuria, they maintain an engineering college having six laboratories, one of which is electrical and well equipped.

BIG AMERICAN FLAG UNFURLED IN BOSTON

An unusually large American flag was unfurled on the day the war congress assembled, by a department store

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Flag Unfurled in Boston as Congress Convened in Washington to Declare War

of Boston, Mass. It measured 100 by 50 ft. and when hung over the store front covered four floors of the building. Half a dozen buglers blew "To the Colors" as the huge flag was unfurled at noon, while all within sight sang "The Star-Spangled Banner."

MOVE TO RECLAIM TEXAS OVERFLOW LANDS

Areas of land in Texas estimated at not less than 6,000,000 acres, now of comparatively little value because subject to overflows or undrained, may be reclaimed if the people pass an amendment to the constitution, to be voted on this summer. This amendment provides for the establishment of suitable reclamation and conservation districts without regard to county lines, and for the issue of bonds to cover the cost of the necessary projects, with the approval of the property owners of the districts affected. There are some 2,000,000 acres of overflow lands alone, lying along the principal rivers, and nearly all can be reclaimed by the construction of levees. Such lands have a present value of from $15 to $25 an acre, but in other cases, as soon as protected from periodical overflow, the value has jumped to between $100 and $150 an acre. A state conservation and reclamation association has been organized to work for the passage of the constitutional amendment, which is required to remove certain limitations of public effort.

SYSTEM OF FOOD CONTROL NEEDING NO TICKETS

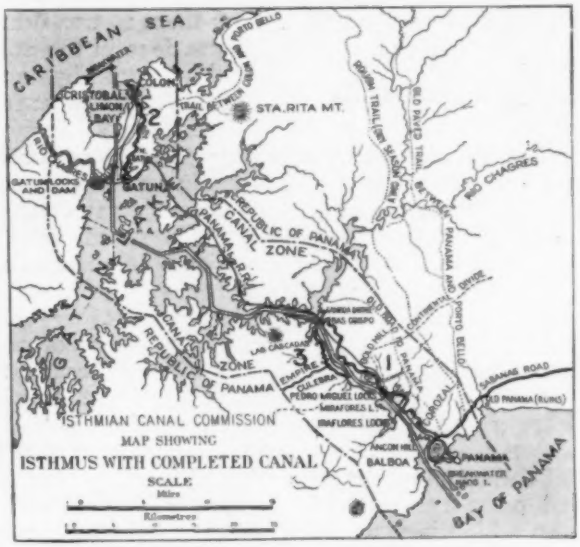
Under a system of food control proposed in England to secure the same results as issuing tickets permitting the holder to purchase bread, meat, butter, and other supplies (the German system), every householder would be compelled to keep an official "housekeeper's book." All purchases of food would be entered in this book by the shopkeepers, and after a fixed date no food would be sold unless an official passbook was presented. The book would sell for two cents and upward, according to size. It would show the number of adults in each household, also the number and ages of children. Separate columns would be provided for entering different kinds of food, so that the quantities bought could be seen at a glance. No new book would be issued until the old one was returned for official inspection.

¶It is reported that there has been found in Texas a large deposit of bituminous rock filled with fossil fish very similar to those in the Austrian Tyrol whence America heretofore has obtained its ichthyol oil, a liquid much used for medicinal purposes.

ROAD BUILDING IN THE PANAMA CANAL ZONE

AMONG recent improvements and innovations made by American engineers in the Panama Canal Zone may be reckoned many miles of surfaced and asphalt-concrete roads. Some of these roads rank with the best in the world, and make automobiling amid the tropical scenery delightful all the year round.

There is no road, however, across the isthmus, and as the completion of the canal has cut off highway communication between the two sides of the canal, there are now three separate areas in which automobiles may operate. The first of these is at the Pacific end of the canal, embracing the city of Panama and the Canal Zone as far to the northwest as the Chagres River; also the roads leading into rural sections of the adjoining Republic of Panama, known as the Sabanas district, in the direction of the ruins of Old Panama and the Juan Diaz River. The roads in this area consist of 21 miles of city streets in Panama, 17.5 miles in the



Where the Good Roads of the Panama Canal Zone are Situated: The Large Figures, 1, 2, 3, Indicate the Three Separate Areas Where Automobiling Is Now an All-the-Year-Round Delight. The Asphalt-Concrete Roads, Indicated by the Heavy Black Lines, Are among the Best in the World

Laying the Asphalt Surface on One of the New Roads at Balboa: These Roads are Finished Like City Streets, and New Mileage is Added Every Year

Sabanas, and 48 miles in the zone. The total length of connecting highways is 85.3 miles.

The second important area of good roads is at the Atlantic or northern end of the canal. This includes the city of Colon with the adjoining town of Cristobal, having eight miles of streets together, and a road leading to Gatun, a distance of nine miles, making a total of 17 miles of road for this area.

The third area is on the west side of the canal and embraces the three villages of Culebra, Empire, and Las Cascadas, and a road running from Empire to the Canal Zone boundary—a total length of 18 miles of auto roads.

Improvement and extension of the roads in the zone and contiguous territory of Panama are going on all the time. The asphalt-concrete roads built at the south end of the canal—over 15 miles—are founded on a broken and rolled-stone base, on which is placed a layer of macadam, and finished like city pavements, with a surface layer of asphaltic concrete. These roads are proving durable, both against traffic and the wearing rains of the tropics.

There are about 600 automobiles licensed in the Republic of Panama and the Canal Zone, most of them operating under reciprocal licenses which allow them to travel in either territory. License fees in the zone were recently greatly reduced by executive order and are now as follows: for pleasure automobiles, $5 a year; motor vehicles carrying passengers for hire, $20 to $30 according to power; auto trucks, $20 to $40 according to capacity; motorcycles, $2. The speed limit is 25 miles an hour on straight roads and 12 miles in city or village streets, or when approaching another vehicle or traversing curves, forks, or crossroads.

Chauffeurs licensed to drive in the Canal Zone are required to carry an official card of identification, under a recent regulation designed to do away with abuses of licenses in the illegal transfer of badges and license cards to others than the authorized holders. This card states the age, color, sex, height, weight, color of hair and eyes, and nationality of the holder, and bears a photograph made by the official photographer at Balboa Heights.

Highway Scene in the Panama Canal Zone, Where the Highest Products of Modern Engineering Skill and Scientific Road Building are Faced by the Structures of a Primitive People

Two of the Motor Busses Operated by the Panama Railroad Company in the Canal Zone are Shown in the Photograph Above, Running on a Smooth-Paved Highway Typical of the Good Roads Which American Engineers have Recently Built

A Charming Bit of Scenery on One of the New Panama Roads: With Tropical Vegetation, Feathery Palms in Profusion, and Smooth Dustless Highways, the Lot of the Motorist in the Canal Zone Is a Happy One

One of the Recently Finished Asphalt Streets at Balboa: With a Base of Broken Stone, Layer of Macadam, and Surface of Asphaltic Concrete, They Stand the Tropical Rains Well

All the Roads in the Zone Are Good, in the Sense of being Easily Traveled Over. The Road Shown Here Is Capable of Improvement, but Its Delightful Surroundings Make It a Popular Drive for the Panama Motorist

LINCOLN STATUE UNVEILED IN CINCINNATI

One of the most notable products of American sculpture in late years was unveiled before a great throng of citizens in Cincinnati on March 31, when a fine statue of Abraham Lincoln appeared to public view. The statue is of heroic size and towered above the heads of the crowd that filled the public square selected as the site, to listen to the presentation speeches.

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Scene at the Dedication of the Lincoln Statue of Heroic Size, Recently Presented to the City of Cincinnati by a Newspaper Editor and His Wife

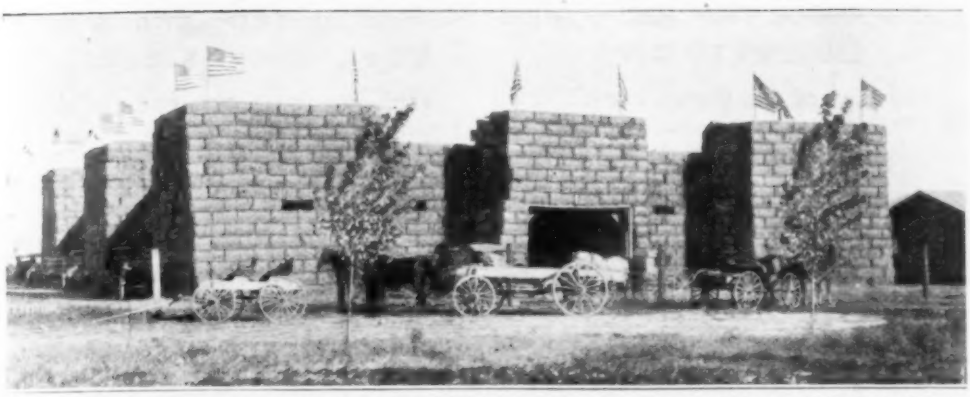
INDOOR AIR RIVALS DESERT IN ARIDITY

That the air in certain well-ventilated, steam-heated offices is drier in winter than the air of a desert, was shown by tests of indoor and outdoor humidity made by an observer of the United States Weather Bureau at Topeka, Kans. Observations were made three times daily for 40 days in the office in question, which was kept at a temperature of 72°. For the period the average indoor relative humidity was found to be 23, which approximates that of Death Valley, Calif., in the summer. The outdoor humidity in Topeka, during the period in which the test was made, averaged 82. The average relative humidity during the driest month of the year is about 35 in Yuma, Ariz., and 29 in Santa Fe, New Mexico.

ELECTRIC DECORATIONS FOR INAUGURATION WEEK

Among the many decorations that gave Washington a gala appearance during inauguration week, the electrical display on the government printing office attracted special attention. Red, white, and blue lights showed the outline of the building at night, while white bulbs were used in making a large map of the United States on the side of the structure. In the center of the map was a profile of the president and on either side of it were the words "Our Country" and "Our President." A large five-pointed star was placed just above the map.

Government Printing Office in Washington as It Appeared at Night during Inauguration Week: The Lights Which Outlined the Building Were Red, White, and Blue. The Rest Were White



Unusual Structure Made from 600 Tons of Baled Alfalfa, in Which Washington Farmers Held Their Country Fair. The Walls Were 25 Feet High and the Building was Electrically Lighted

"PALACE" OF BALED ALFALFA HOUSES FARMERS' FAIR

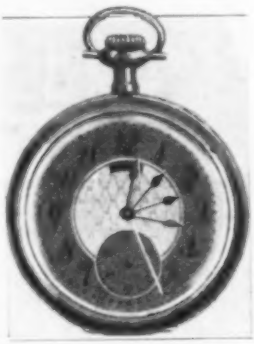
Farmers in the vicinity of Sunnyside, Yakima County, Wash., did a distinctive thing when they erected a "palace of hay" in which to hold their annual country fair. Some 600 tons of alfalfa were used in building the structure, whose walls were 25 ft. high. It not only housed all the exhibits, but a rest room, information bureau, and a grand stand in front of which a vaudeville program was given daily. The hay was loaned by the farmers and at the end of the fair was auctioned off at a very good price.

NEW FOOD-DRYING PROCESS HAS MANY ADVANTAGES

A process of drying fruits and vegetables is now being employed in this country by which it is claimed the weight of a truck load of mixed vegetables can be reduced to 100 lb. Treated in this way the food retains its flavor and fresh taste because its cellular structure has not been injured by the desiccation, it is said, and on being soaked in water it regains much of its former fresh appearance. A pound of dried soup vegetables will make soup for 60 persons. Special interest attaches to the process at this time because of the advantages it offers in provisioning troops. The new method involves the use of air heated to a more moderate temperature than is usually employed abroad in such work, and in insuring a thorough circulation of the air, so that it reaches every particle of the fruits or vegetables being treated. From two and one-half to five hours is required to complete the process.

FIVE-HANDED WATCH TELLS TIME OF FOUR ZONES

The four hour hands with which the novel watch, shown in the accompanying illustration, is provided are so arranged that they indicate the time of day in the four time zones into which the country is divided. One hand is silver and is set according to eastern time. The one next to it is blue and indicates central time. The third hand is red and shows mountain time, while the fourth is green and is set the same as the watches and clocks on the Pacific coast. A timepiece of this sort is serviceable to men in transportation service and also for persons in such cities as Detroit, where the railways follow a different time system from that obtaining in the municipality.



OLD HORSE TEACHES OTHER HORSES TO DIVE

The task of the diving horse shown in the accompanying illustration is not merely to give exhibitions for its mas-

Horse Diving from a Platform 30 Feet High, in an Oakland, California, Park: This Animal is Said to Have been Diving 23 Years and Serves as a "Teacher" for Other Horses

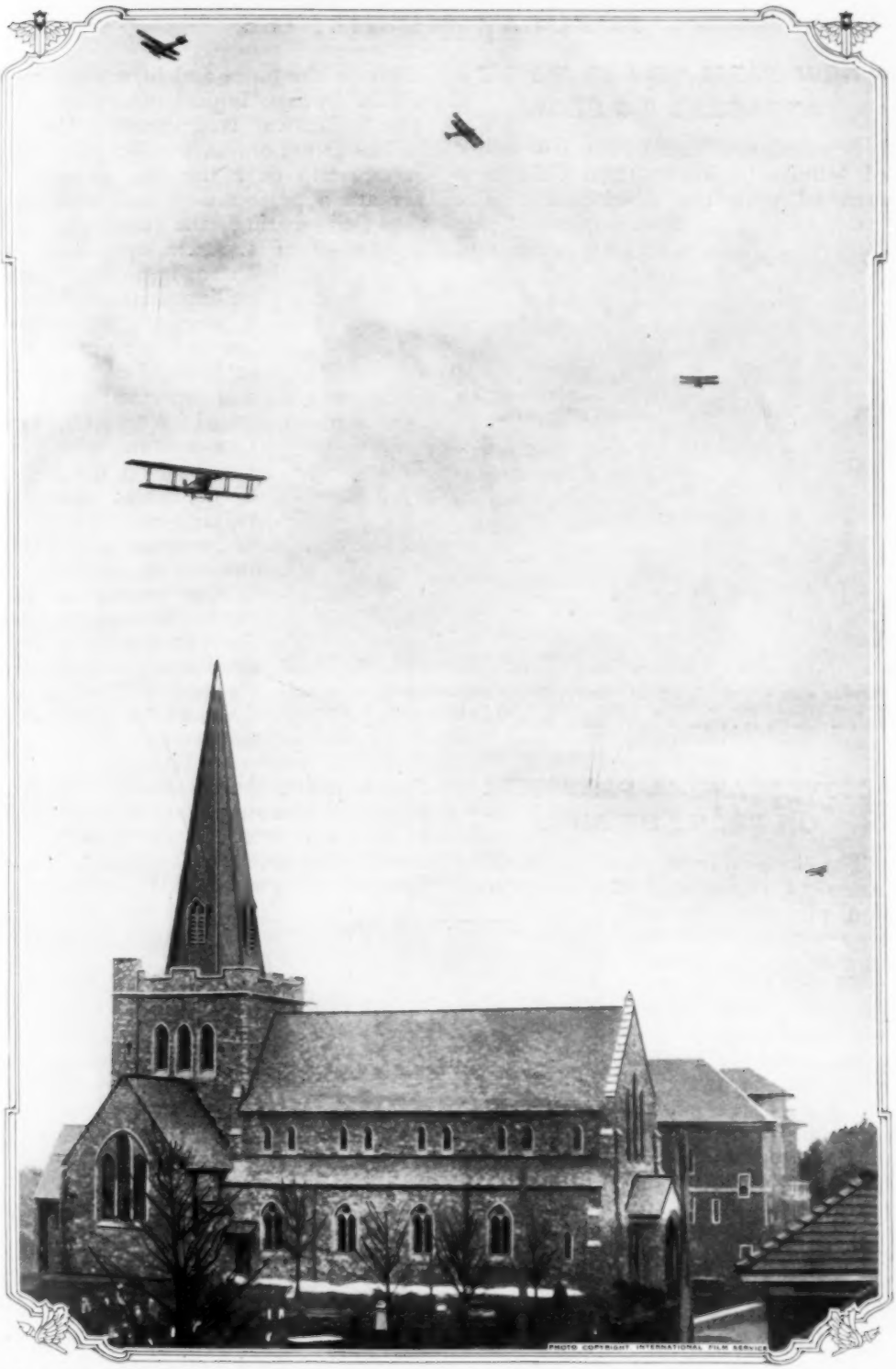
ters in a California amusement park, but also to teach scores of other horses to dive. The animals that are in training are allowed to watch their "teacher" make several plunges from the second platform, which is 30 ft. high. They are then made to leap from the first platform, which is 15 ft. high, and after a few trials they seem to lose their fear. The more experienced animal has been diving for 23 years, it is said. One of its tricks is to make the plunge with a woman on its back and then swim to shore with its burden.

GREAT BRITAIN MAKES MOVE TO SAVE FUEL RESOURCES

Fuel conservation is one of the vital problems that has been faced in Great Britain since the government assumed control of the coal fields. A special board has been appointed to carry out a broad program of scientific inquiry. The importance of the step will be appreciated when it is remembered that the water-power resources of the British Isles amount to comparatively little, and that the kingdom's industrial progress depends almost entirely upon its fuel supply. The board is charged with the task of investigating the character, preparation, and use of all kinds of fuel available. Recommendations made by it, and approved by the advisory council and the privy council's committee of scientific and industrial research, will be carried into effect. In this way it is hoped to uncover new sources of fuel and save millions of tons now wasted.

AIRMEN SCATTER FLOWERS UPON COMRADE'S GRAVE

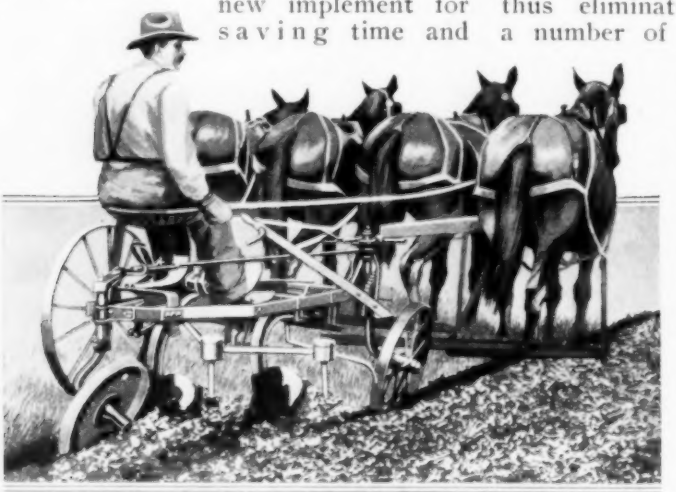
When Peter Carl Millman, the airman, was buried a few weeks ago, flowers were dropped upon his grave from a dozen aeroplanes that circled above the little churchyard in the East where the funeral service was conducted. It was in this way that a group of the airman's comrades paid to his memory a picturesque and fitting tribute that impressed itself upon the minds of all those present. The custom is one which has been observed many times, especially among the gallant fellows at the front. While the deceased, who was popularly known as "Tex" Millman, was not killed in action, the final rites were no less filled with meaning. The flier, a mere youth, was an instructor of the First Aero Corps. He was known in many parts of the country for the spectacular feats he once performed in exhibition flights. In his five years of aerial experience, he never met with accident. His death was due to pneumonia.



Scattering Flowers upon the Grave of "Tex" Millman: Five of the Twelve Aeroplanes That Circled Aloft during the Airman's Burial in the Little Churchyard

NEW FARM TILLER TO BE ATTACHED TO PLOW

A young graduate of the University of Minnesota Agricultural College is credited with the development of a new implement for saving time and labor on the farm, and increasing crop yields by an important percentage. The implement is designed to be attached to the ordinary sulky plow, and in one trip over the field is said to prepare a perfect seed and root bed, thus eliminating the necessity for a number of separate operations of harrowing, disking, and rolling. It consists of a steel-toothed rotor, set to the right of the moldboard of the plow and operated at high speed by a small gasoline motor, which is mounted on the frame of the plow. The revolving teeth pulverize and mix the soil as it is turned up, and throw it out evenly at the rear. Seeding may be done at the same time if desired. A larger size of the tiller is made for use with a tractor.



Plowing with a New Tilling Attachment Which Makes a Good Seed Bed at One Trip of the Implement: The Rotor Seen to the Right of Each of the Plowshares is Provided with Steel Teeth Which Pulverize the Soil

MOVIE-CAMERA PLATFORM ON FRONT OF AUTO

The close-up front views of speeding motorists, reproduced so often in motion pictures, are not always taken from an automobile immediately in front of the car containing the actors but frequently are obtained from a platform projecting in front of the machine photographed. Film directors have found that the latter arrangement insures accurate focus of the camera and, of course, dispenses with the use of a second automobile. The platform is supported by strong beams that project under the car and rest on the bumper, thus relieving the camera of considerable jar. The support is large enough to hold two men and the camera, the latter being securely fastened in place by means of a rod and wire.

Motion-Picture Photographer Obtaining a Close-Up View of Speeding Motorists: The Camera is Securely Anchored to the Platform

COMMENT AND REVIEW

WOULD you trust an important message to a telegraph operator who first touched his finger to a key only the week before? Would you choose to operate on your limb or body a medical student in his freshman year? Would you want to ride on a railroad train behind an engineer who had previously been only a chauffeur? Or do your banking with a popcorn wagon? Not one of these possibilities is a bit more illogical or absurd than to expect raw, untrained troops, in whatever numbers, either to safeguard us against threatened invasion or defend us when one is made. These very words will be read by more than one man who at some time was a victim on stagecoach or passenger train where a single bandit, armed only with a mask and revolver, held up and robbed the entire party, and simply because they were unprepared.

Universal Training the Only Way

It is not surprising that our people hesitated when universal military training was proposed. It seemed to savor too much of Prussianism to the Simon-pure American; and to the son born here of foreign parents it appeared as one of the chief reasons why his parents left their fatherland and crossed an ocean to find liberty. However, an unpleasant duty has rarely been fully met by volunteers—suppose only volunteers paid taxes, for instance! To rely on volunteers puts a penalty on patriotism and rewards the unpatriotic; there is nothing fair or just in it. We are not a warlike people; we have no desire to add to our territory unless by friendly purchase; and it is hardly believable that any congress would declare war with an overwhelming majority of the people set against the undertaking. The training of our future armies should begin in the high school and continue until we have at all times at least 2,000,000 men ready for active service.

I have no patience with the weaklings who cry "disgrace to be drafted." Is there any disgrace, or only honor, when, the family threatened by a madman, the father calls all his sons who are fit to come to his assistance in its defense? When Uncle Sam calls, all the boys should respond.

FROM all the angles of improved self-respect, physical development, recognition of authority, and a better rounded-out young manhood, the military training has everything to commend it. There is a great difference between the three consecutive years required in some European countries and what is contemplated here. Nor is there any probability that the American spirit would ever lead our officers to assume or tolerate that arrogance and personal abuse of their inferiors in rank which has existed for years in the army life of Germany. This is illustrated in a story told me a few days ago by a private in the national guard of a southern state, which had just returned from several months on the border. When they first reached Texas not a few of the members were fresh volunteers, with considerable to learn. Their commander, a regular-army man who had been many years in the serv-

Training a Good Thing

ice, when making an inspection at two o'clock in the morning, found one of the new men, who was on sentry duty, asleep. Next morning the offender was called before the officer, who read him the regulations and the punishment prescribed in such cases. He did so in a firm but not unkindly manner. Then he said to the boy: "Do you realize that when on sentry duty you occupied not only a place of utmost responsibility, but the highest position in the country?"

Inasmuch as the camp was many miles from the border, with thousands of troops between himself and Mexico, the private admitted it had not occurred to him. "But you did," continued the officer, "for as sentinel you had authority to stop and challenge the President of the United States." The young man accepted the light punishment imposed with a grateful heart and became one of the best soldiers in his company. The incident, however, not only illustrates the need of proper training, but of that spirit of personal interest on the part of the officer in a well-meaning but very raw recruit, which marks the difference between Americanism and Prussianism.

While the military training will do great things for the young man of good family and sterling principle, it will do vastly more for thousands of young men who have drifted into a more or less purposeless mode of life, a class from which the great army of young criminals are enlisted. It will make men of these. A Chicago judge, who sat for years on the bench of both the city and county criminal courts, says: "If every idle young man in Chicago between 17 and 25 were put into a military-training camp today, the criminal cases would decrease 80 per cent tomorrow. And when they finish their training, thousands would have been transformed into real men with respect for themselves, who now respect neither themselves nor anything else."

THE report in this issue on conditions found at the recruiting stations, by a member of our staff, may be disappointing but is by no means disheartening, for Chicago and Illinois then led the country in enlistments. On the very day when these slackers were hiding behind a marriage license, 3,200 Chicago high-school boys, from 14 to 17 years of age, with a few 18 years old, were parading the loop in Chicago, carrying real muskets, and displaying a military bearing and drill of high order. Old soldiers who viewed the parade almost wept for joy at what the boys had accomplished with only three weeks' drill, and that in addition to their regular high-school work.

Why Are Slackers?

Let us not delude ourselves, however, with the hope that we can make a seasoned army in a few weeks. We flatter ourselves we can deliver a well-drilled soldier in as few months as any other nation, and quicker than some; but as in many other processes, a certain minimum is inexorable and cannot be reduced.

Why are not the young men thronging to the colors instead of to the license bureau? While scorning the slacker, let us be fair, and not

include scores of those youthful grooms who married because they enlisted the following day.

And why are the young men not enlisting by the ten-thousands?

For the same reason these same young men—and the majority of older ones—do not make their will. The reason for enlisting and the reason for making a will appear as a vanishing point on a far-distant horizon. Today only a few people, comparatively, actually realize we are at war. Our cities are not being bombarded; hostile troops are not sweeping across the land with the devastation of a cyclone; enemy ships have thus far not possessed our ports of entry nor burned our coast cities. For nearly three years we have been saturated with war news, but of a war which seems almost as far away as if on another planet. And we have thought and read and talked of this far-away war so long, our eyes have become adjusted to long-distance lenses, and we do not instantly change their focus to here and now.

Then, too, the stories of months of inactivity, so far as any offensive or defensive is concerned, brought back by the thousands of state militia who were camped in Texas, have given the impression of an apparently purposeless mobilization. It was by no means purposeless, although one company of cavalry of which I knew was five months in camp near El Paso, and during that time was allowed to fire only 10 shots per man in target practice. These conditions have doubtless caused a certain reaction, for if there is any one trait which stands out strong in the American, it is an overwhelming aversion to what he considers inactivity. If there were to be real fighting tonight or tomorrow millions of the untrained would impulsively grab a gun and go out to the combat with the same promptness and zeal as the farmers at Lexington and Concord, and with nothing like their preparedness. But they would go; and what a wicked, needless penalty to pay! The experience of the English, as stated by the visiting commission now at Washington, should forever settle this question, which admits of no argument.

We will awake to the situation, but it may take us some time to do so. Even in England enlisting was no tidal wave until a few Zeppelins had cast their deadly shadows and the noise of falling bombs awoke the sleeping thousands.

VAST amounts of edible corn, tomatoes, pickles, string beans, pumpkins, apples, peaches, grapes, and other fruits and vegetables, are allowed to rot on the ground each year in this country.

Can Food at Home

The average family with a garden is supplied so bountifully during the season that long before the first killing frost comes waste begins. In the country and country towns especially, there is little or no profitable market for the overproduction. This year not a pound of vegetable food capable of being saved, by drying or canning or preserving, should be allowed to spoil. The boys can render splendid service by care of the garden and gathering the produce, and the girls can do their part in preparing and canning. The process of cooking for canning is not difficult to learn,

nor too exhausting to perform, and this year we should put upon our shelves for next winter's consumption millions upon millions of quarts of canned food. This will release an equal amount, which otherwise would be taken from the output of the big canneries, and which can go to feed our own Army and Navy or be shipped abroad to starving Europe. No boy or girl need wait until he or she is older in order to do some great thing. If only 5,000,000 families can an extra 100 jars each, the result will be 500,000,000 jars more than last year, and that is anything but a small accomplishment. Don't let a pound of food go to waste this year. Those of us who are not already thrifty must learn to become so, and once the habit is formed, the results are so surprising and satisfying it becomes a pleasure.

WE are very short on sheep. Our 50,000,000 sheep at their best can only grow enough wool to make each one of us a suit of clothes once in four years. The foreign wool which under normal conditions came to us is now largely diverted to war purposes. Thousands of boys and girls can each raise one or two sheep and find sufficient pasture on their own lawn, thus turning into food and clothes the grass which has previously been thrown away. More poultry can be kept, and be fed on the present waste from kitchen and table. We must all learn thrift, and break away from our thoughtless, heedless disregard of waste. Waste is little short of a crime at any time, and fully that in these days when millions are sadly underfed and thousands are actually starving.

Boys, Raise a Sheep

IT has always been the policy of this magazine never to reprint an article which had once appeared in its pages. For the first time in its history I will break the rule with the following from an editorial in our October, 1912, issue:

High Standard in Our Navy

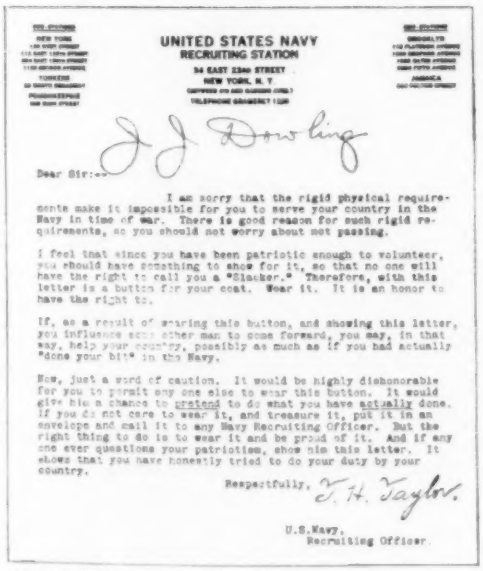
The transformation from the sail-propelled man-o'-war to the complicated mass of machinery known as the modern battleship is not one bit more pronounced than the improvement which has taken place in the personnel of the men who compose the human working parts of these great machines. Time was when the Navy was looked upon by many as a sort of reform school, a last resort to which young men could be sent who were not quite bad enough to be put in jail and not good enough to roam at large. Such conditions have fortunately passed away and the American Navy today is composed of brains and muscle of the highest order and a personnel of which the country can well be proud. I was specially impressed with this fact when during the past season I spent some days in a well-known New England port which is seldom without one or more naval vessels during the summer. At this particular time there were four battleships and eight smaller fighting craft, with a total of over four thousand men on board. On two of the battleships

the men had not set foot on land for six months — an unusually long time — and naturally were anxious to get ashore. When I saw the ships' steam launches towing the long lines of boats filled with a thousand men with 24 hours' shore leave, "a hot time in the old town tonight" seemed to me inevitable. And there's where I guessed wrong. The young men were allowed the fullest liberty; they had plenty of money and were very live wires; and the saloons and places of amusement were making special efforts and working overtime to attract visitors.

When the 24 hours expired and the launches came puffing into dock again, I watched the boys load into their respective ships' boats, and out of the thousand, two, just two boys, required assistance from their comrades. And the chief of police told me his men had not had occasion to arrest a single man. To me the high standard of conduct, the respect for the uniform, and respect for one's self, which is taught these young men, was a most impressive thing. Can you imagine 1,000 young men of equal age, landsmen, including clerks in banks, offices and stores, and skilled young men in all the various mechanical trades, going out on their first holiday in six months, with plenty of money to spend, and all restraint removed, and coming back at the end of 24 hours with only two men "disabled"?

The conduct of the boys of the Navy, ashore in their own land, with less necessity for constraint than in a foreign port, deserves the highest commendation, and better words of praise and congratulation than these few lines express.

April 25th. H. H. WINDSOR



UNITED STATES NAVY
RECRUITING STATION
34 EAST 23RD STREET
NEW YORK, N. Y.

J. J. Dowling

Dear Sir:-

I am sorry that the rigid physical requirements make it impossible for you to serve your country in the Navy in time of war. There is good reason for such rigid requirements, so you should not worry about not passing.

I feel that since you have been patriotic enough to volunteer, you should have something to show for it, so that no one will have the right to call you a "Slacker." Therefore, with this letter is a button for your coat. Wear it. It is an honor to have the right to.

If, as a result of wearing this button, and showing this letter, you influence some other man to come forward, you may, in that way, help your country, possibly as much as if you had actually "done your bit" in the Navy.

Now, just a word of caution. It would be highly dishonorable for you to permit any one else to wear this button. It would give him a chance to pretend to do what you have actually done. If you do not care to wear it, and treasure it, put it in an envelope and mail it to any Navy Recruiting Officer. But the right thing to do is to wear it and be proud of it. And if any one ever questions your patriotism, show him this letter. It shows that you have honestly tried to do your duty by your country.

Respectfully, J. H. Taylor.

U.S.Navy,
Recruiting Officer.

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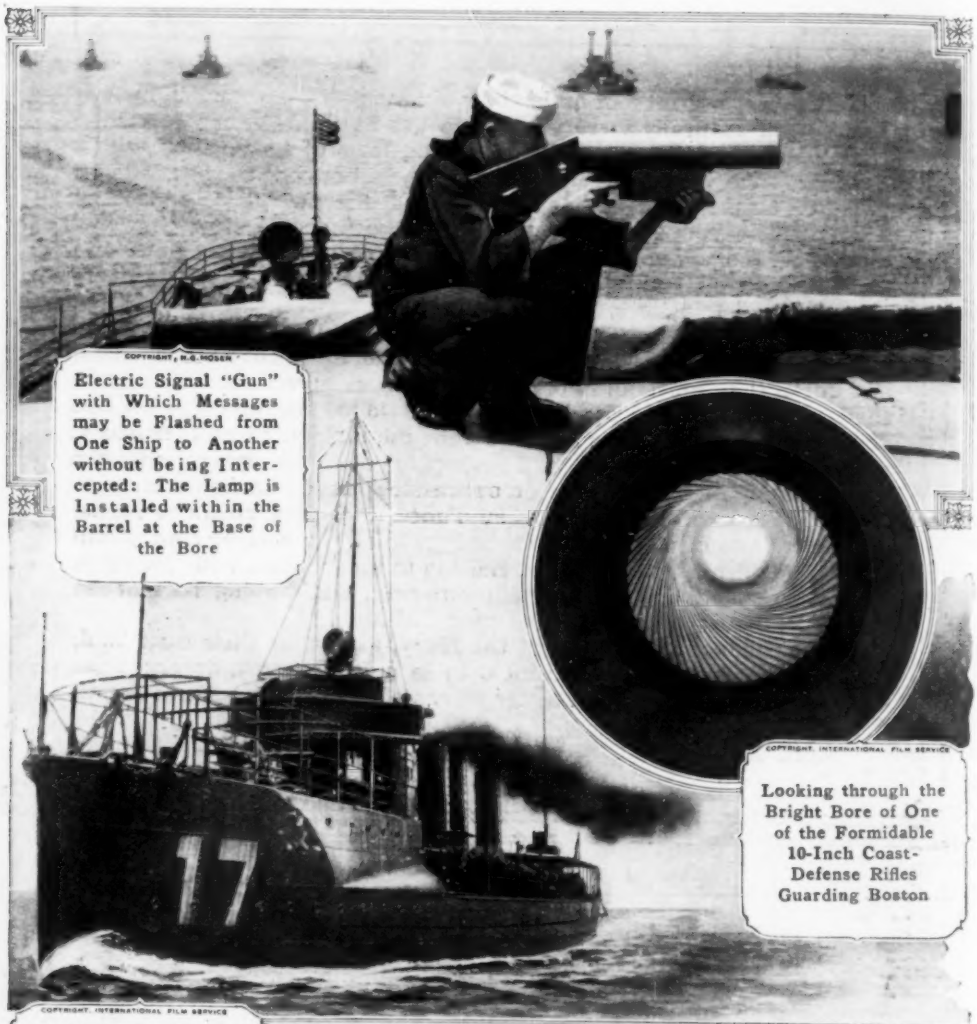
HONOR BUTTONS PRESENTED TO REJECTED VOLUNTEERS

Upon our entrance into the world conflict, prompt steps were taken by navy recruiting stations at New York to protect men of patriotic motives from being confused with spineless slackers because of their civilian attire. Buttons bearing the inscription: "I have volunteered for the navy—have you?" were issued for persons who applied for enlistment but, because of physical imperfections, could not be accepted. When presented, the badge is accompanied by a letter which establishes the holder's right to wear it in full view on the lapel of his coat.

If a New Yorker, and Not in Uniform, This Button will Show Your Spirit

INTERESTING VIEWS OF OUR COAST DEFENDERS



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Electric Signal "Gun" with Which Messages may be Flashed from One Ship to Another without being Intercepted: The Lamp is Installed within the Barrel at the Base of the Bore

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Looking through the Bright Bore of One of the Formidable 10-Inch Coast-Defense Rifles Guarding Boston

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It Was the Destroyer "Smith" That on April 16 Reported by Wireless That It had been Fired Upon by a German Submarine. Subsequently, However, It was Announced at Washington That the Vessel had Not been Attacked, but That the Periscope of an American Submarine had been Sighted. All of Which Is Not so Funny as It Sounds

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Taking Heavy Fieldpieces, Armored Motor Cars, and Similar Equipment Ashore, Is One of the Bits of Hard Work That Frequently Falls to the Lot of a Landing Party of Marines. The Picture Reproduced Herewith Shows a Steel-Protected Car being Carried Shoreward in an Open Launch by a Group of Sea Soldiers

BRITISH AND FRENCH COMMISSIONS IN AMERICA

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The French Commission, Headed by René Viviani, Former Premier, Entering the Gates before the Henry White Residence at Washington, Where the Members were Entertained during Their Visit at the Capital. They were Escorted through Cheering Throngs by the Mounted Guard That is to be Seen Drawn Up along the Curb

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Arrival of France's Official Representatives to the War Conference: The "Mayflower," the Presidential Yacht, Which Carried the Visitors to the Navy Yard, Is Visible in the Background. In the Foreground, Left to Right, Are: Secretary Lansing, Marshal Joseph Joffre, and Former Premier René Viviani

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Approaching the State Department Building to Call upon Secretary Lansing, the British Foreign Minister, Arthur James Balfour, Middle, Chief of the British War Mission, and, Left, Sir Cecil Spring-Rice, British Ambassador

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The Breckenridge Long Residence Was the Headquarters of the British Mission. The Picture Shows the Crowd That Formed before the Grounds When the Party, Headed by the Right Honorable Arthur James Balfour, was Received. Both the French and British Delegations were Welcomed Tumultuously by the Populace

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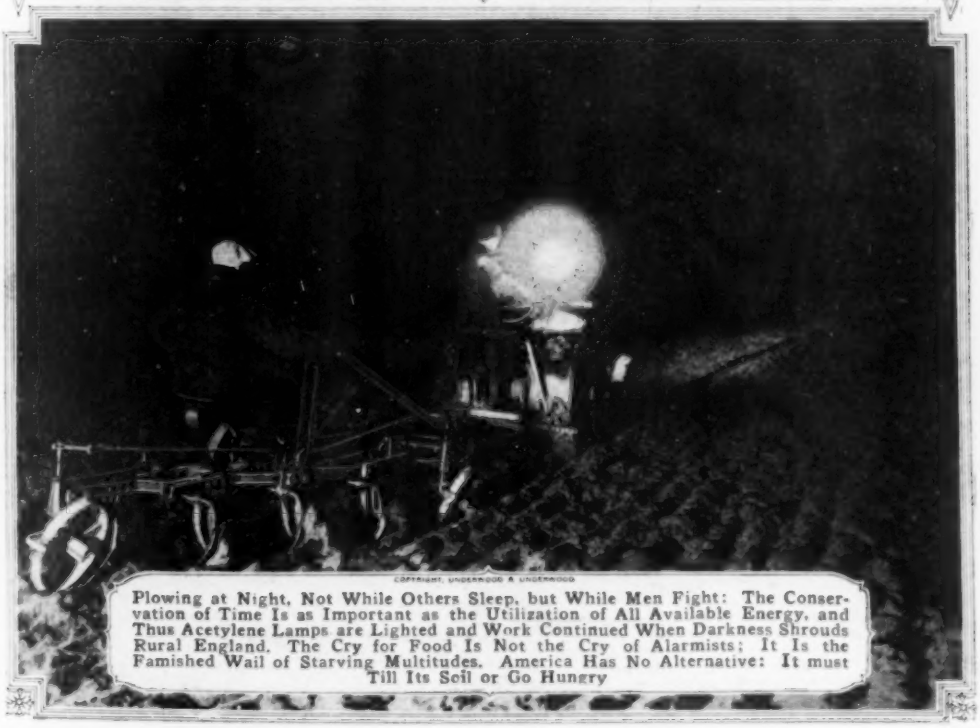
BIRTH OF THE WORLD'S NEWEST REPUBLIC

DURING those eventful days in March when the Russian people overthrew autocracy and semialien bureaucracy, giving birth to national freedom and justice, no single incident was more fraught with importance than that which occurred before the Kazan Cathedral in the Nevsky Prospect at Petrograd. The photograph reproduced herewith shows the vast throng of hungry men and women assembled in the great thoroughfare. When the soldiers were ordered to fire into this mob and disperse it, the people knelt. It was then that the first Cossack regiment rebelled, killed its officers, and joined the populace, thus dooming the Romanoffs.

FOOD PREPAREDNESS NEW PHASE OF WORLD WAR

Vital Counsel for America is Given by the Two Photographs Presented on This Page: Each Shows at a Glance the Extremities to Which England is Going in Its Struggle for Food. The Picture Above was Not Inspired by a Circus Press Agent, for in Great Britain Men and Horses Are at the Front, While Women—and Even Elephants—are Plowing the Ground and Making Every Fertile Acre Produce



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Plowing at Night, Not While Others Sleep, but While Men Fight: The Conservation of Time Is as Important as the Utilization of All Available Energy, and Thus Acetylene Lamps are Lighted and Work Continued When Darkness Shrouds Rural England. The Cry for Food Is Not the Cry of Alarmists; It Is the Famished Wail of Starving Multitudes. America Has No Alternative: It must Till Its Soil or Go Hungry

GLIMPSES OF FRANCE'S GALLANT HEROES

On the Desolate Road to St. Quentin: An Officer Dashing Ahead of the Artillery to Select Advantageous Positions for the Big Fieldpieces That are being Brought Forward

Nowadays We Hear Little of Poison Gas, but the Soldiers, Horses, and War Dogs at the Front Have Little Chance to Forget It. The Picture Shows Masks Applied to Men and Horses

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At Geneva, in Switzerland, the Musée Rath, the Neutral Clearing House for All Prisoners of War: The President of the International Red Cross with One Stenographer Founded the Institution a Fortnight after the Outbreak of Hostilities. Some 1,200 Volunteer Workers are Now Employed Forwarding Mail to, and Answering Inquiries Concerning, War Prisoners Everywhere in Europe

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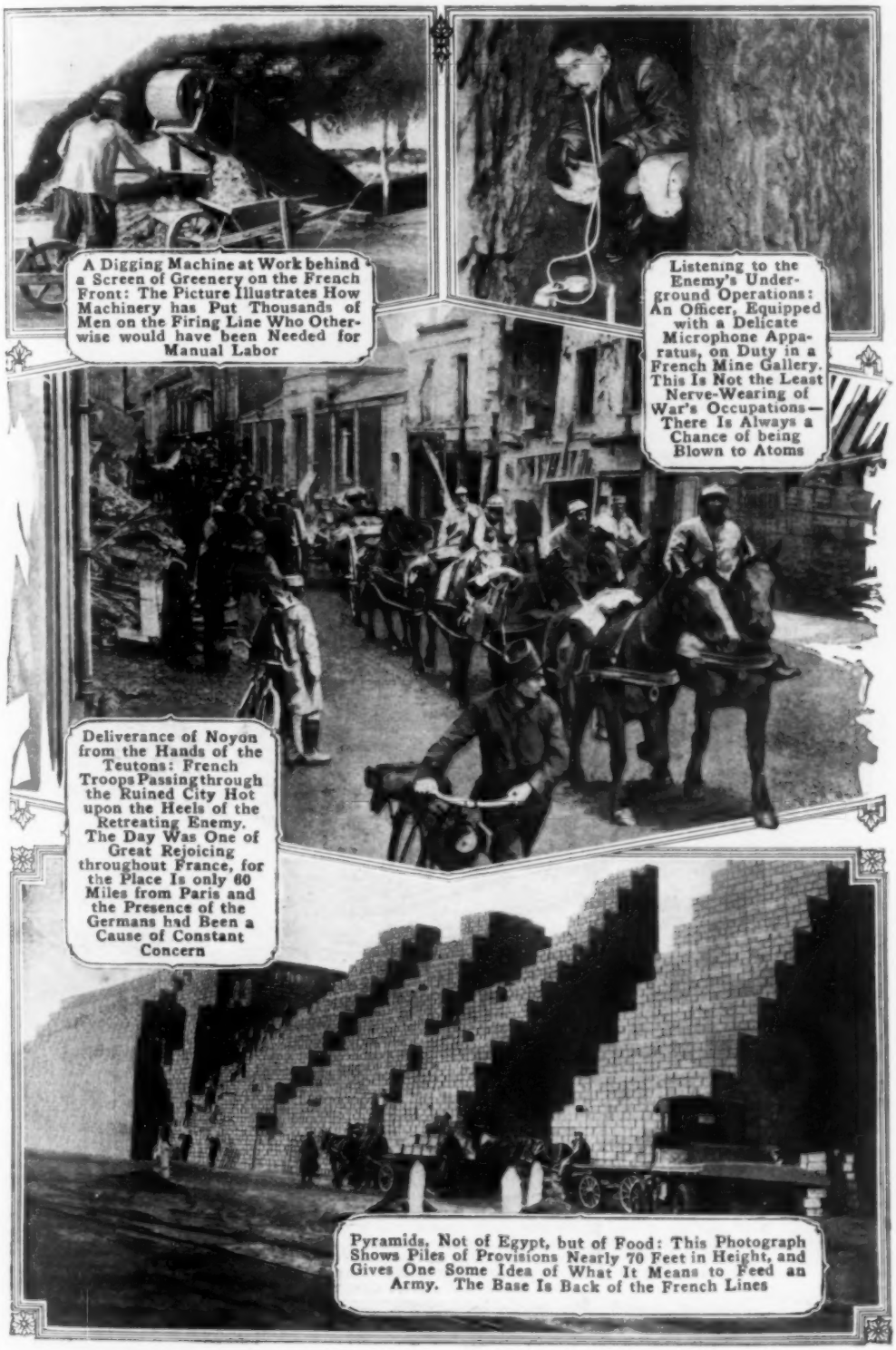
One of the Far-Seeing Eyes of the French Navy: A Tricolor Flying Boat and Its Crew. Although They have Had Little Chance to Distinguish Themselves Spectacularly, Craft of This Type Are as Vital to the Sea Fortes as Aeroplanes Are to the Land Fighters

AT WORK IN THE SORRY BUSINESS OF WAR



A Digging Machine at Work behind a Screen of Greenery on the French Front: The Picture Illustrates How Machinery has Put Thousands of Men on the Firing Line Who Otherwise would have been Needed for Manual Labor

Listening to the Enemy's Underground Operations: An Officer, Equipped with a Delicate Microphone Apparatus, on Duty in a French Mine Gallery. This Is Not the Least Nerve-Wearing of War's Occupations—There Is Always a Chance of being Blown to Atoms

Deliverance of Noyon from the Hands of the Teutons: French Troops Passing through the Ruined City Hot upon the Heels of the Retreating Enemy. The Day Was One of Great Rejoicing throughout France, for the Place Is only 60 Miles from Paris and the Presence of the Germans had Been a Cause of Constant Concern

Pyramids, Not of Egypt, but of Food: This Photograph Shows Piles of Provisions Nearly 70 Feet in Height, and Gives One Some Idea of What It Means to Feed an Army. The Base Is Back of the French Lines

FINIS OF GREAT ZEPPELIN AND ITS INVENTOR

Twisted Metal and Blazing Débris: Remains of a Mighty Zeppelin That Ventured Too Far from Home. The Photograph was Taken near Paris Recently After the French Gunners had Accomplished Their Task. Obviously, None of the Crew Survived. This Is the Fate That Now Usually Concludes the Voyages of These Bulky Aerial Dreadnaughts When They Brave French Defenses or Attempt to Reach London

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Military Funeral of Count Zeppelin, Who Devoted Years of His Life to the Development of the Rigid Dirigible, Which, for Military Purposes, has Been a Staggering Disappointment to the German War Lords. The Failure of the Zeppelin to Give the Teutons Dominion of the Air, However, does Not Lessen the Scientific Value of the Inventor's Work. The Picture Shows Uhlans Bearing the Casket of the Late Count

OUR FIGHTING SPIRIT

By SEARLE HENDEE

WHEN the test came, the soap-box predictions of certain pacifists and little-army politicians failed. A million men did not spring to arms before sundown, April 6. Thousands, however, formed weak-kneed lines in front of marriage-license wickets.

Conditions that prevailed at Chicago the first two weeks of the war were fairly representative of those encountered throughout the nation. An attempt was made to measure the city's war spirit. Several interesting, and a few somewhat surprising, observations resulted.

Nowhere did the application for khaki uniforms exceed the limited supply on hand. Although accepting nearly twice as many volunteers as other offices in the United States, the recruiting places were far from filled. Street crowds did not appreciably differ from those in weeks past.

The day was chilly and mist filled the air. Yet 20,000 men and women packed the Cubs' ball park to see the Pirates defeated. Soldiers on recruiting duty there worked hard, but failed to find one man in the whole howling mob, willing then and there to shoulder a rifle. In the loop district a taxicab scraped a large limousine, bending a fender slightly. Some 200 men and boys swarmed about the machine in a moment's time. Across the street two soldiers walked unmolested, back and forth, in front of a recruiting station, inside of which was one civilian, and he a tottering Civil War veteran. During noontime more than 1,500 persons watched a guardsman drill a handful of office workers in Grant Park. Recruiting tents pitched near by barely attracted notice.

At the county building about 800 men and women jammed the corridors on the second floor, where marriage licenses are issued. Many, but not all of them, were of foreign extraction. Slackers and cowards they were called by jeering spectators, but none showed signs of resentment. A dozen fellows in khaki worked among them trying to find fighters. It was a record day; fifteen men agreed to enlist. The rest of the license seekers shook their heads or turned away. Man after man freely admitted the significance of his purpose and grinned anæmically when a yellow ribbon was pinned to his coat. The sight was astounding. In the course of the day, 591 licenses were granted. On the other hand, 550 men applied for enlistment at army-recruiting places, and of the number about a third were accepted.

A well-groomed youth stepped from a squatty roadster. "Why don't you enlist?" he was asked.

"What's it to you?" he shot back, and then added: "Wait until there is something doing."

A Clark Street "panhandler" whined that he was hungry. "Why don't you enlist?" it was suggested.

"You're all right, kid," he confided, "but slip me a dime."

To the query, a commercial artist parried: "Do you remember the Mexican fiasco? They made goats of the fellows at the border."

A waiter in a loop restaurant was approached. "Why don't I enlist?" he returned. "I would if the country was invaded. But why go to Europe and be shot to ribbons?"

When an unmarried young lawyer was questioned, he explained: "I am fit, but untrained. I would have to go as a private. Who wants to do that? Besides, I would lose my practice."

On an "L" train a companion strap-hanger was interrogated.

"When I am needed," he assured, "I will go. But first, why don't they rope in those West Madison Street I. W. W.'s and Grant Park bums?"

Then a well-known cavalry colonel was interviewed. "Is the American youth patriotic? Is he willing to fight, or does he want 'George to do it'?" the soldier was asked.

"Our young men," he responded, "are divided into two distinct classes.

Some are red-blooded patriots. Some are cowards. There is no middle group. A boy is either patriotic or unpatriotic.

"My regiment is getting young fellows of an exceptional type. They are eager for battle and will scrap like demons when trained. It may surprise you, however, that the majority of them are the sons of foreign-born parents. Old American stock is not particularly in evidence.

"The American boy, when it comes to enlisting, is hindered by several things. He hates like blazes to be inconvenienced. He thinks of the business chances he will lose while in khaki. He counts the financial cost of patriotism. He wants to be sure of service before joining the army. If he knows there is to be shooting, he may come in. But he wants to fight on the day he enlists. He wishes to avoid months of training. His reasoning is inconceivable, for when stirred he aches to grab a flag in one hand, a rifle in the other, and chase the enemy. He doesn't realize that marksmanship counts for more than mere enthusiasm; that the soldier who wins is the one who sticks, who has strength plus, who can keep his head, who can hit when he fires.

"Many American youngsters have had advantages denied others. Therefore they do not want to be privates. They want to be officers. They want to learn soldiering out of a book and get into the Officers' Reserve Corps. One can't make soldiers by giving boys books to read. Neither can soldiers be built by drilling fellows around the floor of an armory. Go to any good musical comedy and you will see chorus girls drilled better than any company of soldiers ever found on a parade ground. But can they fight?"

Down on South State Street, where cheap movies and maudlin vaudeville shows thrive, many recruiters were in evidence. "What is the spirit in the streets?" one was asked.

"They don't insult us any more when we spike them to enlist," he replied. "Those who come in have enthusiasm. Some reply: 'I'll be with you soon,' and others, 'Wait until things start.' We get smiles where we once got insolence and curses. The temper in the streets is endurable."

An officer in charge of a recruiting station was visited and was asked to give his opinion of the slackers' line at the county building.

"What do I think of any pack of yellow-striped cowards?" he flared. "How many of these cads would make soldiers if we had them? Few could even be used as powder monkeys. If the rush keeps up, it may become damaging. That is not expected, however. We are much pleased with the class of men who are joining, but not satisfied with their number. When the bars are let down, and the term of service limited to the duration of the war, enlistments will increase materially. Many men do not want three years of active service and four years in the reserve unless they are needed."

That same afternoon Washington announced volunteers would be received in the manner described. True to prophecy, enlistments swelled, but by no means to the degree anticipated.

"What is the war spirit of the women?" The question was asked at the Red Cross headquarters. The answer was:

"Oh, gracious! we are simply swamped. Two thousand women have offered their services in two weeks. We have 5,000 enrolled here now. Half of them are trained in special lines. The others are capable and willing to do whatever is asked. They are of all ages and of splendid type. Never fear! There will be women enough with patriotism and enthusiasm galore."

Thus America's fighting spirit, as reflected at Chicago, had not reached its traditional temperature a fortnight after congress announced the existence of war. The world crisis was viewed with amazing calmness and indifference. The feeling prevailed that the silver dollar could defeat the greatest professional army on earth; that we had only to pay the price of admission and view Armageddon from reserved

seats. And this in spite of announcements that France had plainly told our government it was in dire need of men. No ripple of excitement, or burst of enthusiasm, greeted Washington dispatches proclaiming it evident that we might shortly be compelled to send troops to Europe's trenches.

The mass of America's youth still waits for "something to happen."

PHONOGRAPH REPLACES MILITARY BAND AND DRILLS "TOMMIES"

Several striking uses have been made of the phonograph in England during the course of the present war. Before the British resorted to conscription, the talking machine was frequently employed in different ways to attract recruits. Owing, doubtless, to the lack of officers at that time, and also for the purpose of attracting curiosity seekers, recruits drilling in public squares and thoroughfares were occasionally given their commands by phonographs. The novelty of seeing a squad of soldiers responding to orders called out by a cabinet gramophone that had been carried into the street never failed to draw the attention of passers-by, and that was what was wanted. More recently, the dearth of musicians has now and then made necessary the substitution of phonographs for military bands at home. The County of London motor volunteers, for instance, march behind a "Tommy" who carries a talking machine strapped to his back. The instrument grinds out tuneful martial airs needed to put ginger and spirit into a body of soldiers on parade. It seems a queer makeshift, but apparently the loquacious squeaking of a portable talking machine is more desirable than silence.

British "Tommies," Officered by a Phonograph, Drilling in London before Street Crowds: This Is One of the Several Unusual Uses to Which Talking Machines have been Put by the British during the War

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STYLES AND FADS ENGENDERED BY WAR

Flag Sticker Worn on Collar: A Fad among Some Youths

The Stars and Stripes Used as a "Beauty Spot" Pasted on the Cheek

Illustrating the Suit Formed by Wearing the Cape as a Skirt

For the Military Woman Chauffeur, the Apparel Illustrated Above and at the Sides Seems to Embody Practical Features of Comfort, Freedom, Warmth, Durability, and Attractiveness. From Cap to Puttees, the Same Material is Used

The Coat Is Heavy and Loose, Giving Warmth and Freedom. Its Lines Are Dignified and Becoming to the True-Blooded American Girl

Old Glory Ornamenting Silk Hose

The National Colors Decorating White Kid Cloves

The War as Reflected in Summer Millinery: A White Milan Straw Decorated with the Red, White, and Blue. The Stripes Are of Grosgrain Silk and Extend around the Crown. The Stars are Embroidered on a Blue Field

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NEED OF ENGINEERS IN REAL-ESTATE DEALS

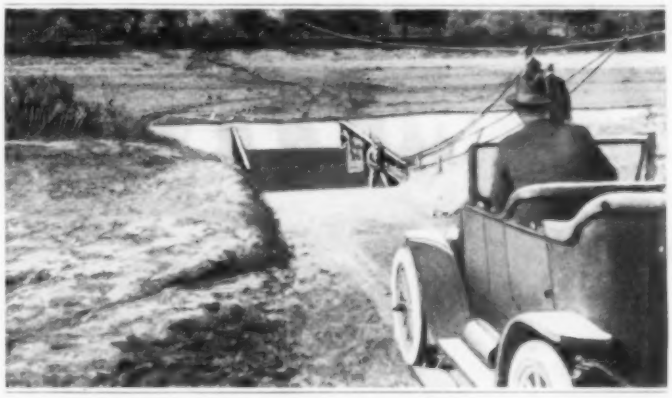
That engineers as well as lawyers should be consulted when real estate is to be purchased, is the contention of an engineer who recently read a paper dealing with this question before the Iowa Engineering Society. The speaker cited instances in which purchasers had suffered loss because they had not called in a technical man as well as one to look into the legal phases of the deal. Not only should a real-estate buyer be sure that the lines of the property correspond to the lines indicated in the deed and that buildings do not overlap these lines, but in many cases he should have an engineer report on the sewage, gas, water, and electric service.

OCTAGONAL SUMMER HOME ENCIRCLED BY REDWOODS

A San Francisco business man has done an unusual and picturesque thing by building a summer home at the base of Mt. Tamalpais in the midst of a graceful cluster of redwoods that form a circle about 15 feet in diameter. The structure is of wood, two stories high and octagonal in shape. Outside stairs lead from the yard, which is somewhat below the street level, to the second or main floor.

CURRENT PROPELS FERRY ON NORTH DAKOTA RIVER

About 20 miles south of Watford, N. D., the Little Missouri River changes its course so often that the sparse population of the region have decided that it is unprofitable to span it with a bridge and instead have installed a ferry that operates very easily indeed. Between the two high-water banks a cable has been suspended many feet above the stream. A flat-bottom scow, large enough to hold two automobiles, is attached to this cable by means of ropes terminating at their upper ends in pulleys. When the ferryman pushes off from shore he points his craft a little upstream and the current soon carries it to the opposite side.

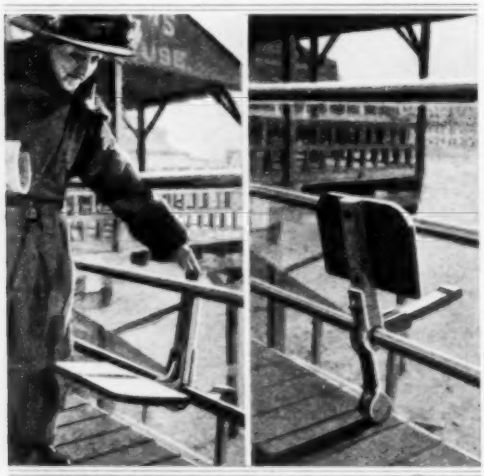


Ferry Which is Attached to Overhead Cable by Means of Ropes and Pulleys: By Pointing the Scow Upstream When Pushing Off from Shore, the Current Carries It to the Opposite Side

SEATS FOR BOARD WALK HAVE COUNTERWEIGHTS

Seats that automatically tilt upward when unoccupied have been installed along the railing of the board walk at Atlantic City, N. J., thereby providing rests that occupy less space than chairs or benches. Each seat bottom is supported by an arm that is pivoted to the lower pipe of the iron railing and is counterbalanced by a weight at the opposite end of the arm. When the rest is not in use the weight drops down,

causing the seat to swing up into a vertical position, out of the way of passers-by. A second arm, fastened securely at right angles to the one already mentioned, is so placed that it strikes against the outside of the rail when the seat is swung downward and so holds it in a horizontal position for the occupant.



Counterbalanced Seats Fastened to the Railing along the Board Walk at Atlantic City: When Not in Use Each Seat Automatically Tilts Up, Out of the Way of Passers-By, as Shown at the Right

BIG TENT ENLARGED TO SHELTER TRACTOR SHOW

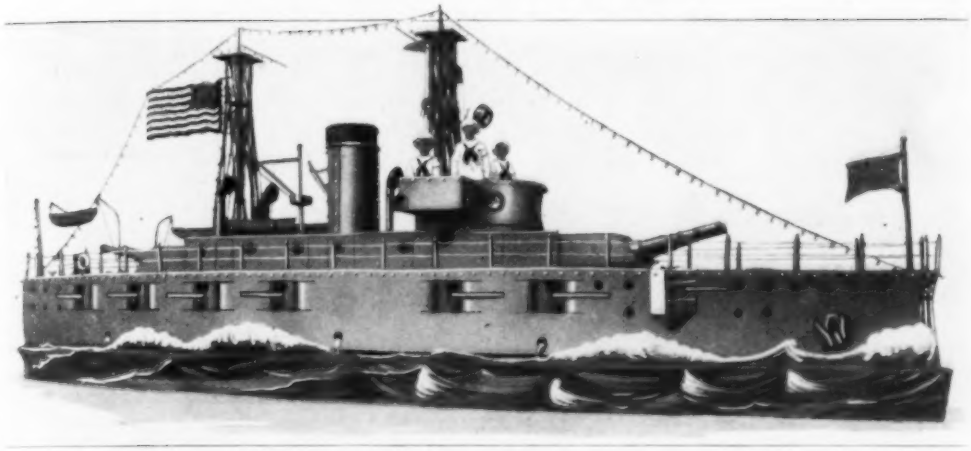
An unexpectedly large number of entries for a tractor show, held recently in Kansas City, Mo., made it necessary to twice enlarge the tent of paraffined khaki canvas provided for the exhibition. After the extra sections of canvas had been inserted between the ends the shelter covered 42,000 sq. ft. of ground, thus making it one of the largest tents in use, for displays of this sort. The inclosure was heated with charcoal burners and floored with planks resting on 8 by 8-in. beams.

EDUCATIONAL CENSUS SHOWS CHINA'S SCHOOL EQUIPMENT

Of late years, with the introduction of Occidental ideas and influences, China's educational facilities have been materially increased. In proportion to its vast population, however, the country has but few schools and extremely few institutions of higher learning. Recent statistics show that only 19 colleges are open to those who want general courses. Added to these are eight engineering, four medical, 59 law, and 91 industrial and technical schools. Of primary and secondary schools there are 53,204, aside from 527 primary and middle schools maintained by some of the more advanced institutions. Ninety-three public seminaries, 507 normal schools, and 357 schools for girls are supported in addition to 1,582 half-day schools.

¶A permanent flood-lighting system has been installed by which the entire exterior of the capitol building at Washington is illuminated at night. The idea was an outgrowth of the lighting provided during the inauguration period.

Big Tent of Paraffined Khaki Canvas, Covering More than 42,000 Square Feet, Used to House a Tractor Show in Kansas City, Missouri



Float, 44 Feet Long, Mounted on a Single Automobile Chassis: Real Smoke Poured from the Funnel, and the Turrets with Their Wooden Guns Revolved at the Will of the "Crew"

AUTO FLOAT REPRESENTS BATTLESHIP IN ACTION

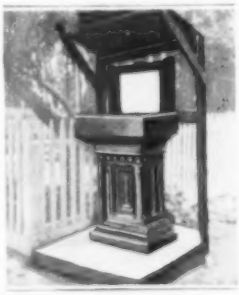
One of the most striking floats in a street parade held recently in Dallas, Tex., was a 44-ft. model of a fighting ship made of canvas and wood and mounted on a single automobile chassis. Realistic wooden guns pointed from revolving turrets, and smoke, produced by burning crude oil with the aid of a blowtorch, poured from the funnel. More than 700 electric lights, supplied with current from storage batteries, decorated the ship and studded a United States flag and a union jack. Festoons of bulbs hung from the 16-ft. fighting masts to the bow and stern. Later the float "sailed" overland under its own power to Fort Worth, 33 miles distant.

BLUE-ASBESTOS INDUSTRY EXPANDING

According to official reports from British South Africa the blue-asbestos industry, which has been established in that country for a number of years, is growing steadily despite the strong competition which it has had from rival interests and the necessity that the producers faced of doing their own manufacturing and selling. The industry is largely controlled by one concern which now has factories in England and Italy. Among the claims made for blue asbestos are that it is lighter than the white, that its fibers are longer and finer, that it is superior as an insulating material, as regards heat, and that it is unaffected by moisture, ordinary acids, or sea water. Even if inferior in heat-resisting qualities to the white product, it is regarded as satisfactory in this respect for most industrial purposes.

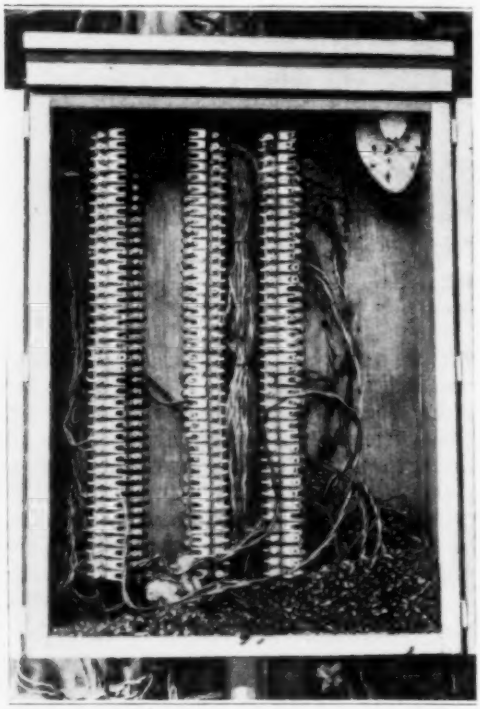
PULPIT IS A SELF-HELP SHOE-SHINING STAND

What appears to be an old pulpit, standing by the roadside in Manitou, Colo., serves as a case in which shoe polish and brushes are kept for the convenience of passers-by. A sign above it reads, "Brush One Cent, Polish Two Cents. If you have no change, you are welcome to use these free." Since there is much dust in and about Manitou in the summer and the streets are thronged with tourists, the materials made available in this unique way are frequently in demand.



BEES USE TELEPHONE BOX FOR A HIVE

Trouble on the telephone lines centering at Port Byron, N. Y., was found recently to be caused by a swarm of



Telephone Terminal Box Used by Bees as a Hive: Comb Making had Begun in the Upper Corner When the Bees were Suffocated and Fell in a Heap Below

bees that had taken possession of the terminal box and were using it as a hive. When the seat of the trouble was discovered, the bees had already started the making of comb in a corner of their new home. The problem of ousting the undesirable tenants from the telephone box was solved by stuffing the cracks with cotton saturated with carbon disulphide, which suffocated the bees.

¶ What is known as an aerological survey of the United States is being urged by those interested in aviation. Such a scientific study of the atmosphere over this continent and adjacent waters as is proposed would furnish valuable data for airmen's charts.

NEW USES FOR MAGNESIUM IN THE INDUSTRIES

New methods of extracting the useful metal magnesium from its ore are being sought by metallurgists. The ore is found in abundance, and magnesium oxide is produced cheaply, costing only a few cents a pound, but the metal itself has hitherto been scarce and expensive because of the difficulty of production. Direct extraction from the oxide by electrolysis is now aimed at by the scientists, and if their efforts are successful, new and interesting uses will be found for cheaper magnesium. In lightness and strength it competes with aluminum, and its alloys may largely displace aluminum alloys in the manufacture of automobile, aeroplane, and dirigible parts. For deoxidizing other metals, magnesium is a much stronger agent than aluminum, and it is also likely to be used therefore as a deoxidizer in industries employing brass, bronze, nickel, and their alloys.

SAVING MILES FOR THE MAIL CARRIER

Many people, unwittingly perhaps, are responsible for making mail carriers walk unnecessary miles every day in delivering mail. Every step added by residents means a total of many in a day, and a big number of miles at the end of a year.

So grave a problem has this matter become in some cities that the postal authorities have taken it up with a view to reducing, or altogether abolishing, the evil. If you put your mail box on your door instead of in a protected place on your gatepost you cause the postman to take a dozen or more extra steps—usually more—every day. If you make him climb a big flight of stairs to hand you your daily mail, you add extra distance to his journey and take unnecessary toll of his pedal extremities.

In hilly towns the mail carrier is ofttimes up against a hard hiking task. San Francisco affords a fair sample of

unlimited abuse of mail carriers by postal patrons in the residence districts. To reach some residence doors mail men must climb not one, but often as many as four and five, and sometimes six flights of stairs. At some homes the stairs number as many as 100 and 125 steps from sidewalk to veranda.

This Is a Very Modest Example of the Steps a San Francisco Mail Carrier has to Climb on His Daily Route

The postmaster of San Francisco has started a crusade against this evil. He is trying to persuade residents to place their mail boxes at the foot of stairways, and if there are no stairs, then as close to the street as possible. There are 75,000 flights of outdoor stairs in San Francisco, a record perhaps unequaled by any other city. The postmaster estimates that if these exterior staircases were placed end to end, they would reach 103 miles up into the sky.

The postal rules require the mail man not to disconnect himself from his bag when filled. But there is no inspector, or other supervising official in the San Francisco service, who has the heart to reprimand the carriers for setting their bags on the sidewalk while running up a "Pike's Peak staircase" to hand in a cloak-and-suit catalog or a picture post card from milady's country cousin. The carrier who attempts to carry his bag up all the stairs he faces is likely never to return for a second delivery.

LITTER WHICH ONE MAN CAN OPERATE

Two large wire wheels, connected by an inverted-U axle and provided with suitable handles, constitute the recently invented equipment with which one man can pick up and carry a loaded stretcher. To lift up a litter of the type used with this outfit, the running gear is wheeled into position over it and the handles raised high in the air. This places the "U" of the axle in a horizontal position and allows two iron hooks, which depend from it, to swing close to the ground so that they can be inserted into eyelets in the side of the stretcher frame. The carrier can then be lifted up easily by bringing the han-

Stretcher Requiring the Services of But One Man Instead of Two: The Axle and Handles Serve as a Lever by Which the Laden Litter can be Lifted from the Ground. Because the Wheels Are Large, the Outfit can be Drawn over Rough Ground or up and down Stairs

Motor Truck Carrying Tin Ore in the Andes Mountains along One of the Highest

dles back into a horizontal position. They are then clasped to the stretcher frame to keep it from tilting.

AIR VENDER IS COMPLETE COMPRESSION PLANT

For installation at the curb line in front of public garages, gasoline stations, and accessory shops, a free-air dispenser has been introduced which contains an electrically operated compressing unit. Because of this feature, there is no necessity for making pipe connections between the fixture and a pumping plant within the building adjacent to it. All the working parts are locked in a compartment that is separate from that in which are housed the hose and starting switch used by motorists. The standard is of heavy design and surmounted by a large opalescent globe bearing a green hexagon on which appear the words, "Free Air." A gauge with a large dial is conveniently located in the front of the fixture and illuminated at night so that readings can be made easily. The arrangement of the valve connector permits the pressure in a tire to be registered on the dial before inflation is commenced.

No Piping is Required When This Tire-Inflating Apparatus is Installed, and No Attention Demanded When It Is in Service

LLAMAS RIVALED BY MOTOR TRUCKS HIGH UP IN ANDES

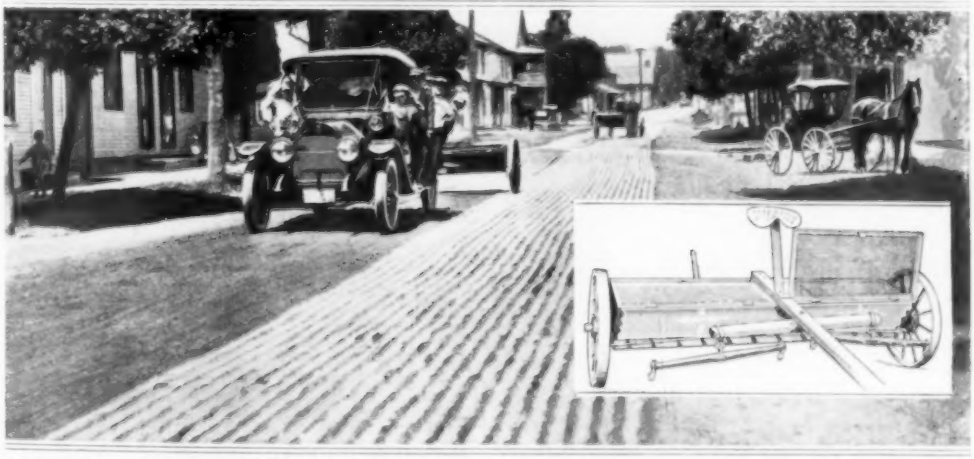
High up in the Andes Mountains of Bolivia motor trucks have become the rivals of the llamas, which are so much used as beasts of burden in South America. Special interest attaches to this case of motor-truck service because the vehicles, of which there are four, are employed at an altitude varying from two to three miles and more. These machines were supplied by a California concern to a mining company in Bolivia to carry tin ore to the railway station at Oruro, Bolivia. This city is 12,000 ft. above sea level, and the road which the cars traverse rises to 17,300 ft. This is undoubtedly one of the highest gasoline-truck routes in the world. The engines were adjusted

Truck Routes in the World: The Machine is Passing a Herd of Llamas, also Laden with Ore

to operate in the high altitude by making the compression chambers very small, so that if operated at sea level the pressure would be about double the normal pressure. This alteration compensated for the rarefied condition of the atmosphere. The carburetor which is used required no adjustment. Although gasoline in this region costs $1.25 per gallon, it is claimed that the trucks show greater economy than the llamas, many of which are still used to carry ore. Each beast's burden is about 100 lb., which is carried only a few miles per day.

SPREAD SALT ON STREETS TO LESSEN DUST EVIL

Common coarse salt, when properly applied to dirt roads, quite successfully allays dust during the dry months of summer. The scheme has been tried in many places, and among them the little village of Belleville, Pa., where it obviates the need of street sprinkling. At this particular town the salt is scattered over the road surface with the aid of a lime spreader. The natural affinity of calcium chloride, which is present in salt, for moisture keeps the



Applying Salt with Aid of Lime Spreader to Dirt Road at Belleville, Pennsylvania. Insert Shows the Lime Spreader Used to Apply the Salt

village thoroughfares fairly free from dust even during very dry periods. The material is applied at intervals of about six weeks at a comparatively low cost. To obtain good results, however, it is necessary that the salt should have an opportunity to become thoroughly mixed with the dirt before encountering a heavy rain. Two or three days, with ordinary traffic, usually suffice to accomplish this.

HOLDER ENABLES CRIPPLE TO WRITE WITH KNEE

The invention of a Portland, Ore., doctor, by means of which one can write with the knee, offers large possi-

Writing with the Knee: By Means of a Simple Pen or Pencil Holder One Deprived of the Use of His Hands can Learn to Write in the Manner Shown

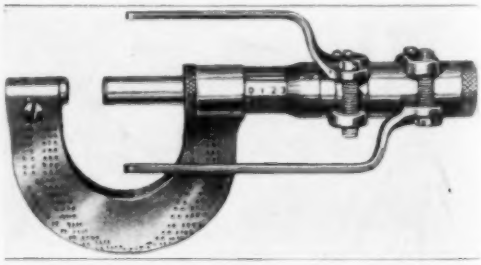
bilities for the person deprived of the use of both hands, for the device affords a much more convenient method of writing than by holding a pencil with the toes or teeth. The apparatus consists of a broad strip of leather that is fastened over the bent knee by means of spring clasps. It is provided with two pencil clips into which a pencil is inserted so that it projects beyond the knee. A low rack, made like a music rack, holds the writing paper firmly in a convenient position. Ample range of motion for the pen is obtained by resting the foot on the ball, with the heel upraised.

PHILIPPINE LUMBER WINS CHINESE TRADE

Certain grades of lumber from the Philippine Islands have largely supplanted American lumber in the Hongkong market lately, owing to the high rates of freight for the trans-Pacific voyage. Imports of what is known in the Chinese trade as Oregon pine (Douglas fir), which formerly averaged about 10,000,000 board feet annually from the United States, fell in 1916 to about 2,000,000 ft. Cheaper woods from the Philippines are now freely used, although inferior in quality to the American product. Philippine hard woods and log timber are also finding a good demand in China under present conditions.

LIMIT ARMS ATTACHABLE TO A MICROMETER

A set of limit arms for use on micrometer calipers has been devised by a British government inspector and possesses obvious advantages as an attachment to that useful gauging instrument. The set consists of a long and a short arm of hardened steel that can be clamped on the thimble of any standard make of micrometer and convert it at once into a limit gauge which can be set for any tolerance between .0001 in. and .022 in. When fitted, it checks the work between the highest and lowest limits permitted, with a great



Limit Gauge Arms, Invented by a British Government Inspector, Attached to a Standard Micrometer

saving in time. The attachment is easily removed when it is desired to use the micrometer in the ordinary way.

WORLD'S BIGGEST TELEPHONE CABLE LAID UNDER THE HUDSON

ONE step nearer a world telephone service, in the opinion of engineers engaged on the work, was taken recently, when the largest submarine cable in the history of the telephone was laid under the Hudson River, between the little cities of Nyack and Tarrytown, N. Y. It was designed to make an important connection between the existing systems on each side of the river, but the installation involved so much experimental work and study on the part of the telephone operatives, to say nothing of numerous physical difficulties, that its success was regarded as significant of what may be accomplished in extending telephone cables under sea in the future.

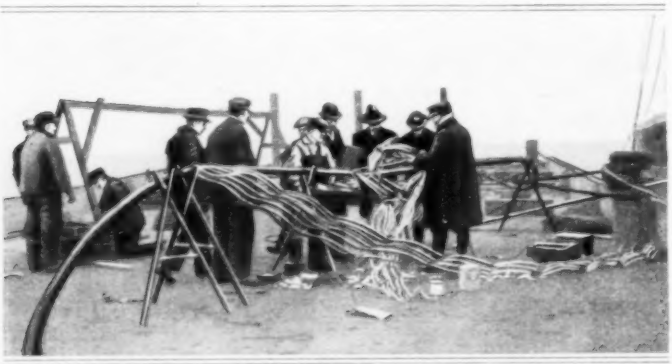
Besides the fact that 14,670 ft. of this heaviest cable ever made was required to span the bottom of the river, the remarkable features of the installation included the use of two loading coils, incased in loading pots 16 ft. long and weighing over four tons each. The laying of the cable was accomplished by the use of a cable tugboat, a sand scow, and a light-draft tug, and took eight days to complete. Each step in the work had been carefully planned in advance by technical experts and involved many different operations, from the arrival of the specially made cable by freight to the final splicing of the wires, the strategic laying of the line, and the anchoring of it on the river bottom by means of chains.

The cable used was what engineers call a "74-pair side and phantom," or in other words one containing 74 pairs of loaded wire, of the particular kind necessary to make possible proper transmission and tests. The cables were thoroughly tested as to water penetration, while the loading pots also were subjected to tests as to their being absolutely water-tight. The cable weighed in the vicinity of 90 tons. After arriving on reels on flat cars, run along a dock accessible to the cable boat, the process of placing the cable on the reel on the tug occupied two days. The scow, on the other hand, was loaded with cable put on in figure "8" form, while the coils and loading pots were also installed on the scow in position, permitting the splicing of the coils and the attaching of the pots. When everything was ready for the cable laying, the cable boat and sand scow went up the river to Tarrytown and Nyack, between which the connection was to be made.

Immediately on arrival at the former city, the land end of the cable was taken ashore and chained. The cable boat then proceeded to the Nyack side with a piece of cable on its reel for that shore end. Two targets, 10 by 5 ft., painted with red and yellow hori-

Getting the Nyack-Tarrytown Telephone Cable Ready for Laying beneath the Waters of the Hudson River: Most of the Cable Lies on a Scow, with the Loading Pots in the Foreground

zontal stripes and 100 ft. apart, had been erected as guides on each shore, opposite each other. When the land end of the cable had been chained ashore at Nyack, the cable boat laid the cable on its reel out from Nyack on the line of the two targets on that side. When the end of the cable was reached, a barrel buoy was attached and thrown overboard. Keeping in line with the targets, the cable boat got as close to the Tarrytown shore as it could, a light-draft tug bringing out a line from the scow which the cable boat wound on its reel, pulling the scow over the shoal water. This started the laying of the cable. The two tugs then hitched up to the scow and towed it out in the river to the first loading pot. While the tug was taking the scow anchor ahead 700 ft., the cable boat used its boom to lift the loading-coil pot off the scow and place it in the river. The cable was anchored to the bed of the river by 200 ft. of heavy chain, laid at right angles to it and fastened at the end. This was to permit a grapple to catch the chain at a considerable distance from the cable, if it should ever be necessary to take it up.



Splicing Ends of the Big Cable While the Scow Lay in the River

The second loading pot was also successfully placed. The barrel buoy holding the Nyack piece of the submarine cable was picked up later and the connection made in a satisfactory manner. In order to control the speed with which the cable was laid, an emergency cable brake was erected on the scow, which was simply two light planks held as levers against the cable by two of the crew. Part of the work was done at night, but the principal laying operations were conducted during the daytime.

Method of Controlling the Movement of the Cable as It Dropped to the River Bed

San Francisco's New Edifice Housing the City and County Offices, Which with Its Site Cost Nearly $5,000,000: The Building Measures 420 by 285 Feet and the Dome Is 306 Feet High. The Exterior is Finished in White Granite, While Bedford Stone and Marble have been Used Extensively on the Interior

SAN FRANCISCO COMPLETES MAGNIFICENT CITY HALL

The city hall in San Francisco, which has recently been completed, is pronounced one of the handsomest and most stately municipal buildings in America. It was erected at a cost of $3,500,000 on a site for which $1,411,000 was paid. Its completion adds a most impressive architectural unit to what is known as San Francisco's civic center. The structure measures 420 by 285 ft. and from its center rises a dome 88 ft. in diameter and 306 ft. high. The outer walls, covering the steel framework, are composed of California white granite, while the corridors and rotunda are finished with Bedford stone and Colorado and Italian marble. The balustrades, portions of the dome, the entrances, etc., are decorated in blue and gold.

¶A seagoing suction dredge has been purchased from the War Department by a ship broker and converted into a schooner. This is thought to be the first time that a vessel of this character has been changed to a merchant ship to work under canvas.

PRESS PRINTS AD MATTER ON PENCILS AT LOW COST

A hand press now on the market is designed especially for printing advertising, or other lettering, on lead pencils, in gold leaf or white ink. One advantage of this machine is that with it even small lots of pencils can be given special imprints at a low rate of cost. The press is provided with a sliding rack that holds 32 pencils. These are covered with a sheet of gold leaf, if that is the material to be used, and then fed into the machine by operating a hand lever. The type is heated electrically, current being obtained from any light socket. A small rheostat governs the temperature and when the type presses the gold into the enamel of the pencil, the varnish acts as a sizing which makes the imprint permanent without further lacquering.

FISHING FACILITIES ON A MUNICIPAL PIER

Special facilities for fishermen have been provided in building the new

Fishing Seat and Foot Rest along the Edge of a Pleasure Pier at a California Resort

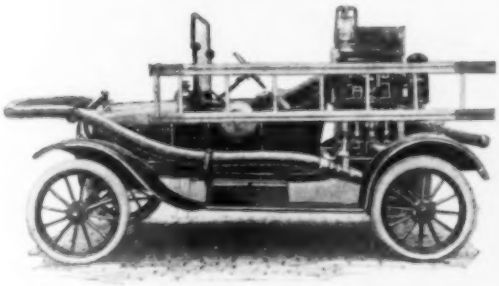
municipal pier at Redondo Beach, Calif., the concrete edge being so constructed as to form a convenient seat, with a foot rest below, which serves to brace the feet when the fisherman is hauling in big fish. The brace is necessary, as fish weighing 290 lb. have been caught from the pier.

HARVARD'S MUSEUM-GARDEN OF TREES AND SHRUBS

Forty-five years ago, with a bequest of $100,000 for "the advancement of agriculture and horticulture," Harvard University started an arboretum, or tree garden, devoted to the task of growing every tree and shrub in the world that can withstand the climate of New England. Today the Arnold Arboretum, situated in a suburb of Boston, extends over 220 acres and contains the world's greatest collection of trees and woody plants. Headed by a botanist of world-wide reputation, its travelers and explorers have ransacked the earth for specimens of tree growth capable of flourishing in the United States, and have added immeasurably to the world's knowledge of its trees and plants, besides developing in Jamaica Plain a tree museum that is a Mecca for students, residents of Boston, and visitors to New England. One of the first lists of trees and plants brought to the arboretum from all parts of the world has just been published, and the last volume has been completed of a tree bibliography which it took the staff 17 years to compile. The scope of the work done is illustrated by the fact that 650 varieties of the hawthorn tree have been discovered to date by the arboretum staff, while only 18 species were known to exist in New England in 1890. There were only four known species of lilacs when the work started; today visitors to the arboretum are made acquainted with 22 species and 200 varieties of lilacs.

LOW-PRICED CAR EQUIPPED FOR FIRE FIGHTING

Efficient fire-fighting apparatus has been placed within the reach of many small communities by an Indiana concern which transforms a well-known low-priced automobile into a fire engine by adding a water-pumping engine just back of the driver's seat, and also by equipping the car with chemical apparatus, hand extinguishers, a gong, a ladder, firemen's tools, a lantern, etc. The outfit can take water from an open source and pump three streams 80 to 100 ft. high, so that in the absence of water mains, cisterns and wells can be utilized effectively. Where the town's hydrant pressure is weak it will add 80 lb. or more to it. As a chemical engine it is very efficient. It derives its pressure from the motor and pump,



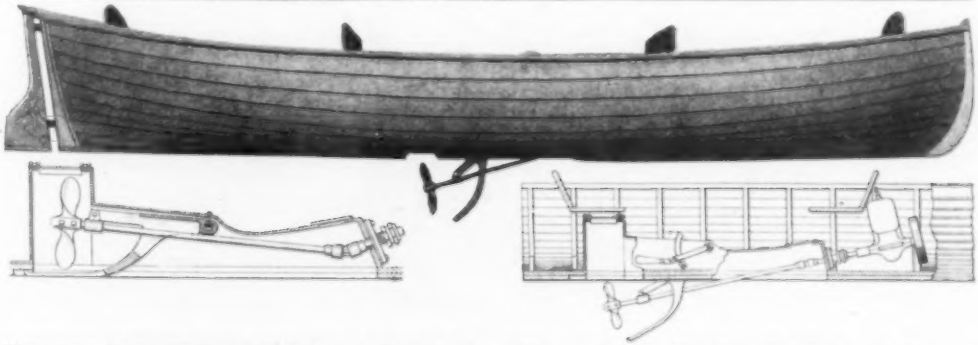
Left: Small-Sized Fire Engine Made by Equipping the Chassis of a Low-Priced Car with the Apparatus Shown. Hose for This Engine is Carried in a Trailer. Right: Low-Priced Car Equipped as a Fire Engine; the Outfit is Here Shown Throwing Three Streams 100 Feet High

which arrangement makes it possible to open the tank at any time and add water or chemicals. One model is made to draw the hose in a trailer, while another is provided with a hose body back of the engine.

DISAPPEARING PROPELLER IN MOTOR ROWBOAT

Equipped with a propeller and shaft that can be made to disappear at will, a new type of motorboat, designed and built by a Canadian concern, is transformable immediately into a rowboat capable of making a landing anywhere. It will also ride without damage over any obstruction, such as submerged logs, driftwood, rocks, or sand bars, being furnished with a skeg which automatically raises the propeller and shaft into a housing above the keel, on striking an obstruction. The skeg, when raised, forms a continuation of the keelson and at the same time throttles the engine from racing. The boat is fitted with an inboard engine on a stationary bed, located so that the weight falls amidships and keeps the craft on an even keel. A handy lever in the flooring gives complete control over the speed of the boat without touching the engine, and also enables the propeller to be raised into its housing when desired. The change from motorboat to rowboat can be made without leaving one's seat.

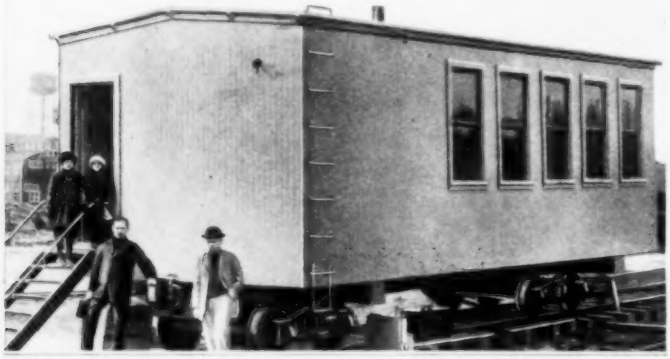
¶Mine timbers of white spruce, Sitka spruce, white birch, and western hemlock, grown in Alaska, were found in recent tests to be fully as good as Douglas fir from the Rocky Mountain region and superior to other Rocky Mountain species for use as mine timbers.



Motorboat Instantly Convertible into a Rowboat by Lifting a Lever: The Propeller Shaft and Skeg are Fitted Amidships and Rise into a Housing above the Keel, as Shown in the Drawing

SCHOOLHOUSE ON WHEELS FOLLOWS ITS PUPILS

The directors of an Oregon school district recently built a schoolhouse on wheels to follow the movements of a colony of loggers whose camp is moved from time to time, making it difficult for the children of the colony to attend a stationary school. Now, when the camp moves, the school goes with it. It is not a transformed box car, though it bears some resemblance to one, but was specially designed for school purposes. It accommodates 30 pupils, and is used evenings and Sundays as a community center for social and religious meetings. As the logging colony is growing, a larger building of the same type is planned, with a room for the teacher. The schoolhouse is hitched to a logging train for removal.



Loggers' Schoolhouse on Wheels: This Itinerant Building may Look Like a Box Car, but was Specially Designed for School Purposes, to Follow a Logging Camp When It Moves

HOMEMADE WHEEL ELEVATES WATER TO TRUCK GARDEN

An odd water wheel and a screw have been combined in an original manner by a truck gardener near Salt Lake City in the construction of a lifting device with which a small acreage is supplied with water from the Jordan River. The wheel, which roughly resembles a windmill wheel, is mounted at the end of a long, hollow shaft containing a screw and is set facing upstream. The shaft is pivoted at its center to an upright framework standing in the water. By means of a cable that winds around a drum, the wheel can be lowered into the current, which sets the wheel and screw to turning. As the water is raised in the shaft it is discharged from the upper end into a flume that leads to the garden.

By Means of a Cable and the Drum, Shown at the Left of the Framework, This Novel Water Wheel is Lowered into the Current. As It Turns, a Screw in the Hollow Shaft Elevates the Water to a Trough That Leads to the Near-By Garden

Labor-Saving Trucks, All of Which, Save One, Have Tongues and Front Wheels Detached: As the Material in the Trucks is Needed the Detachable Unit, Which is Clearly Shown in the Insert, is Hooked onto One of the Loads and It is Drawn Away

NEW LABOR-SAVING TRUCKS SUPPLANT WHEELBARROWS

An especially serviceable labor-saving device which has been introduced into manufacturing plants in recent months is a three-wheeled truck that is now being employed in a number of places in preference to wheelbarrows, elevating trucks, and the like. The front wheel and the tongue of this carrier constitute a unit which can be detached by raising the tongue into an upright position. This lets the front end of the truck down onto a short leg, which then serves as a third support. In the meantime the tongue and wheel can be coupled onto some other truck that is ready for service. This type of carrier lightens the work for a laborer and enables him to move heavier loads than with a wheelbarrow.

PROTECTING PLATE GLASS FROM SUBWAY BLASTS

Storekeepers along Broadway have been compelled to devise means of protecting their plate-glass windows from the effects of the frequent dynamite blasts that occur in the course of New York subway excavation. The most satisfactory method has been found to be the installation of large

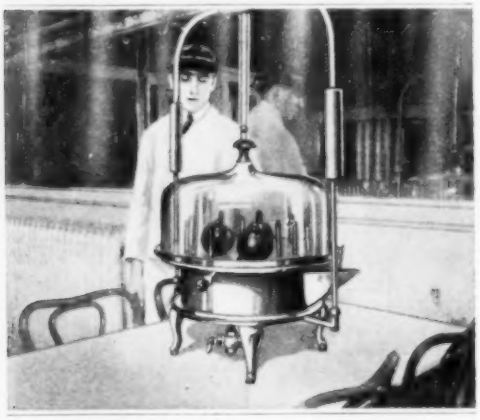
How Broadway Protects Its Plate-Glass Fronts against the Effects of Subway Blasts

wooden crosses, one on each side of the pane of glass in corresponding po-

sitions; each cross having a center arm at right angles to the window, securely braced by wires running to the four corners of the store front. This device relieves the center of the glass pane from much of the shock when a blast occurs near by.

APPLES BAKED WITH GAS IN A MACHINE

The sight of apples being baked by gas on a revolving plate covered with a heavy glass bell, attracted much attention in a Cincinnati restaurant window recently. The apples are first cored by hand and then placed over metal uprights or pegs, set at convenient intervals on the metal plate. Each peg protrudes through its apple, and is in fact a gas burner. When covered with the glass top, the apples are cooked by the heat of these burners.



Apple-Baking Machine in a Cincinnati Restaurant: The Pegs Which Pierce the Apples Are Gas Burners

TIME-SAVING METHODS IN MAKING UNIFORMS

To make hundreds of thousands of uniforms a week, which is the rate at which a New Jersey manufacturer operating four plants has been turning out orders for the allies, requires methods that effect great economy of time and labor. In the cutting, for example, the cloth is laid on a table in 20-ft. lengths, usually 60 folds thick. An expert then marks it out as required by the pattern, after which a man with a circular knife, operated by electricity, follows the chalk line, cutting all 60 layers at once. Band saws are used for cutting the shorter lengths and since the saws are stationary, the operators have to move the cloth about to make it follow the markings.

SHIP'S COLOR A FACTOR IN ITS SAFETY AT SEA

The submarine campaign has brought to the attention of ship owners with renewed force the importance of painting vessels in a manner which will secure a minimum of visibility. Many a captain has learned to his sorrow that his craft has been a conspicuous mark on the high seas because the lower part of the hull and the funnels were painted black, while between these two extremes was a sharply contrasting strip of white or gray. The practice is being urged of painting the funnels a neutral tone and shading the bow and stern off into light gray.

DUPLICATE KEYS QUICKLY MADE BY MACHINE

In our February number we published under this heading an account of an ingenious machine for duplicating cylinder-lock keys. Owing to the fact that such a large proportion of the cylinder-lock keys in use are Yale keys, that is, made by the Yale & Towne Manufacturing Company, we inadvertently referred to the machine as specially adapted to cutting keys of the "Yale-lock type." This was an incorrect expression, as the machine is equally adapted to cut cylinder-lock keys of any make, whether Yale or others. Properly speaking there is no such thing as a "Yale-lock type" of key. Yale keys are made to fit every known type of lock; and the word "Yale" in connection with a key or lock signifies nothing as to type, but merely that it is made by the firm mentioned.

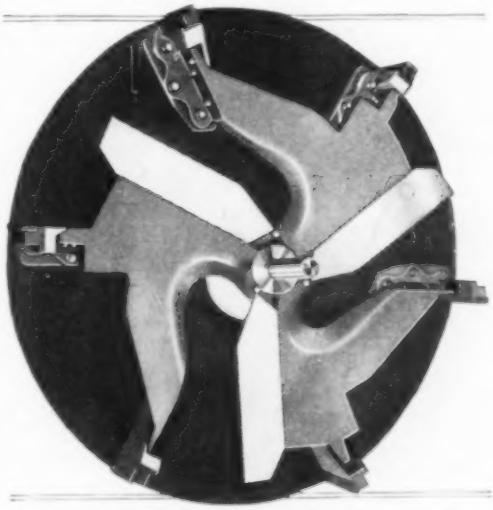
Ten Horses Drawing a Strange Stone Weighing Four Tons to a Playground in Martinez, California: Geologists will be Asked to Determine If the Stone, Which has Long Been an Object of Curiosity, Is a Meteorite

BIG SPHERICAL STONE MAY BE METEORITE

What is believed to be a meteorite was dug up recently near Martinez, Calif., and removed to the public playground of the town, where it will remain. The strange stone was found to be an almost perfect sphere and measures 4½ ft. in diameter, while its estimated weight is four tons. Five teams of horses were required to draw it on a stone boat to the new location. From the days of the earliest white settlers in this region the stone, which lay partly exposed to view, has been an object of much curiosity, and now geologists at the University of California will be asked to determine if it is a meteorite.

NEW DISK THROWER DEVICE FOR FILLING SILOS

A new feature of silo-filling machinery is a disk thrower wheel devised by an Ann Arbor, Mich., concern. It consists of the combination of a solid-steel spider, carrying the knives to cut the silage, and a steel-plate disk opposite this knife wheel and joined to it by a series of fans which, while serving to keep the cut silage in motion, also bind the whole strongly together. The momentum given to the cut material by the knives is accelerated by the motion of the steel disk in the same direction, helping the silage in its travel to the chute for delivery into the silo.



Disk Thrower Wheel of a New Silo Filler: The Cutting Knives, Fans, and Steel Disk All Revolve Together

PAPER MOVIE FILMS AND MOTOR-DRIVEN CAMERA

Paper films are among the latest inventions in the motion-picture industry. They are really not films at all, but are composed of tiny photographs taken with a motion-picture camera and printed on a tough photographic paper the width of the regular celluloid film, with the usual perforations along the edges. These paper substitutes are especially adapted for use in the home or school, both because they are nonexplosive and because their cost is so much less than that of transparent films. A special projector is employed in displaying them. It is so constructed that the tiny pictures are run past an aperture on which are focused the rays of several powerful incandescent lights contained in a circular metal case. The image of the picture is cast on the screen, 15 ft. distant, by reflection, and measures 3 by 4 ft. The machine can be halted, if desired, to permit careful examination of any single exposure. This is a feature of importance in cases where the films are used in the classroom. The same inventor has also brought out a motion-picture camera for amateurs, which can be used without a tripod. It is equipped with a small motor that winds the films while the photographer employs both hands to focus the camera. Power for the motor is derived from batteries carried in the pocket. The machine has a capacity of 100 ft. of film.

Right: Special Machine Used in Projecting Paper Motion-Picture Films. Left: Motion-Picture Camera Which Needs No Tripod

NEW PORT IN PHILIPPINES SHORTENS VOYAGE

A new seaport recently built by the government on the east side of the island of Luzon will shorten the voyage to the Philippines from American ports by three to five days. Manila, the destination heretofore of all army transports and most of the commerce of the islands, lies on the west coast of Luzon, and while convenient for Spanish trade sailing eastward, it involves an unnecessary trip around the coast for American ships. The new port is located at a place called Hondagua, meaning "deep water," which is also the terminus of a new railroad from Manila. The improvements made by United States engineers have laid the foundations for a great modern port, from which passengers can reach Manila in a few hours by the new railroad, and the improved means of transportation will open up to commerce 200 or 300 miles of coast hitherto practically isolated and thousands of acres of rich agricultural lands, producing hemp and cocoanuts in profusion. The harbor at Hondagua is deep, extensive, and almost landlocked by a large island lying across its mouth.

¶ Estimates based on accurate records covering a large part of the United States, show that during a recent year approximately 9,000 persons living in this country lost their lives as a result of conflagrations and burns.

Concerning Public Golf Links

by Searle Hendee

ON one chilly Saturday afternoon last fall, a day not particularly inviting to such an excursion, I reached the golf links in Lincoln Park, Chicago, shortly after one o'clock. It was my first visit to that course, or any public one. Therefore the surprise. On the benches back of the starting tee, and in little groups around the shelter, there were nearly 200 persons. The majority of them were mature men and women. There were a good many young women and a number of boys of the short-trouser age.

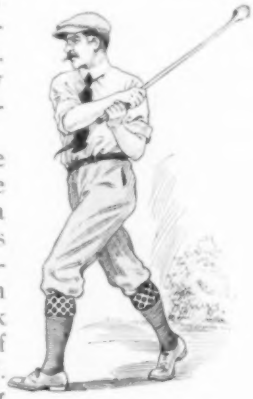
"I recognized my milkman" . . .

I recognized two men: one, my milkman; the other, one of Chicago's foremost corporation lawyers.

The course, which is a nine-hole one, occupies several acres of filled land in a beautiful spot on the shore of Lake Michigan. The fairways are almost flat, the putting greens humpy, and there are no bunkers or ravines. The hazards consist of clumps of shrubbery, that occasionally catch a sliced ball; in one place a few trees, and in another a stretch of rocks bordering the water's edge. To play, one must present himself clubs in hand, register, receive a numbered check, and wait his turn.

On this particular Saturday all of the tickets had been distributed before the afternoon had fairly begun. That meant that as many persons as the links could safely accommodate before sundown, had placed their names on the record sheet. Those too late to draw a number, however, were privileged to put their bags in line. Then, should enough golfers drop out so that time remained after the last ticket holder teed off, those in the second group might play in foursomes, the positions of their bags determining their sequence. After placing my golf bag at the end of the line, started 15 minutes before, I counted those ahead of it. There were ninety-two.

As the afternoon spent itself, the crowd maintained its original magnitude. Many of those who had drawn tickets had gone elsewhere while waiting their turns. So after utilizing some three and a half hours making new acquaintances, I found that approximately 150 players were still ahead of me. An old Scotchman, who bore all of the external evidences of a real sportsman, explained that the course was always crowded on Saturdays and Sundays. He advised an early arrival on the following day.



"and one of Chicago's foremost corporation lawyers."

At six o'clock the next morning there was as large a crowd at the links as I had encountered the afternoon before. After six and a half hours of waiting, I teed off. On the following Sunday, at three o'clock in the morning, 14 men and three women had lined their bags near the starting tee. During the next half hour 34 men and

women approached through the darkness with golf trappings. At four o'clock, more than a hundred were on the grounds. When it grew light, the usual crowd was in evidence. All of this was late in the fall. In midsummer many who wish to get in a game without wasting the entire day plan to reach the links about two o'clock.

"There were youngsters from Halsted Street."

These three visits to the Lincoln Park golf course were illuminating. A crowd composed of men and women willing to arise in the middle of the night, ride several miles in "L" trains or street cars, and then wait two or more hours in the cold and dark; willing to do all that in order to spend an hour and a half on a flat golf course—such a crowd is an interesting one. Likewise a crowd that will sit for six or seven hours in the teeth of a damp wind, or in the full glare of a blighting sun, to do the same thing, is worth studying.

The impressive thing was that not more than one in a dozen of those who teed off were even mediocre players. The crowd therefore was not composed of fanatic golfers. Instead it comprised a group of city flat dwellers who craved a chance to feel green grass beneath their feet, clean air in their lungs, and sunlight on their faces. They wanted to lose the confinement of the office and apartment, limber their joints, and play.

Usually a crowd grows impatient and grumbly with hours of watchful waiting. Not so, however, with this one. Everybody was either laughing, chatting, or just sitting. No one complained because the price he paid for a short game was the greater part of his one day of rest. There were ill-clad youngsters from Halsted Street with decrepit brassies and rusty irons, there were smartly togged young women from the North Shore, there were office boys and clerks with five-dollar outfits, and there were prosperous men and women with motors in the driveway and crack clubs that were as needless as alpine staffs. And in all this mixed gathering, there was nothing but good humor.

In four of Chicago's parks there are public golf courses. The system at these differs, but the conditions are much the same. All of the links are overcrowded. The Lincoln Park course accommodated about 50,000 players last season. At Jackson Park more than 300,000 persons used the two courses that are maintained. At Garfield Park it is estimated that 125,000 persons played around the nine holes.

"An old Scotchman . . . explained that the course was always crowded on Saturdays."

The 50 golf clubs surrounding Chicago have approximately 15,000 members. Initiation fees, ranging from $100 to $1,500, coupled with proportionate dues and high transportation rates, force the average salaried person to the public courses—or a Sunday afternoon walk; and what is true in Chicago is true in many other cities.

Statue and Site Proposed for a Monument to "Buffalo Bill" on Lookout Mountain, near Denver: Parts of Four States in Which Colonel Cody Performed His Exploits Are Visible from This Point. The Town of Golden, Colorado, Is in the Foreground

NATIONAL MONUMENT TO A POPULAR SCOUT

Plans for a national monument to the memory of Col. William F. Cody, known the world over as "Buffalo Bill," have been facilitated by official action of the city of Denver, which has dedicated a most appropriate site for the last resting place and monument of the popular plainsman and army scout. The site selected is on Lookout Mountain, near Denver and 2,000 ft. higher than that city, from which the proposed equestrian statue will be visible. Territory lying in four states—Colorado, Wyoming, Nebraska, and Kansas—which were the arena of the great scout's famous exploits, may be seen from Lookout Mountain, and a painting which depicts Colonel Cody leaning forward in the saddle in typical western scouting attitude has been chosen as a model for the monument. The site is reached by what is known as the Lariat Trail, one of the most spectacular mountain highways in America.

FIBER MEDICINE CASE FOR LABRADOR MISSIONARY

In his long dog-sled journeys across Labrador on errands of mercy, the famous medical missionary, Dr. Wilfred T. Grenfell, has need of a large special case in which to carry medicine for his widely scattered patients. The last case sent to the mission was equipped with aluminum containers, but the atmospheric conditions of the region produced what is called "aluminum disease," the surface of the metal becoming scaly and marked with eruptions. For this reason the case proved unsatisfactory and a new one has been provided which is made largely of fiber and has small containers with fiber coverings. The outfit is inclosed in a case of heavy canvas. It is believed that it will better withstand the rigors of the bleak country.

Medicine Case for Dr. Wilfred T. Grenfell of Labrador, Which is Made Largely of Fiber: It will Take the Place of a Case Having Aluminum Containers That Developed "Aluminum Disease" Because of the Climatic Conditions. Note the Fiber-Covered Bottles

PORTABLE FOLDING TRIPOD FOR MACHINE GUNS

A machine-gun carrier of recent construction is equipped with a folding tripod which can be quickly removed from its place beneath the platform of the carrier, and set up on the ground to hold the gun and its saddle when they are detached from the main mount or pedestal. The tripod has a seat for the operator and is constructed so that it may be swung upon a man's shoulders for transportation; or the machine gun mounted may be carried on his back, leather padding being provided for the protection of the shoulders. The feet of the tripod have claws, to catch in the ground and hold it firm when the gun is in action.

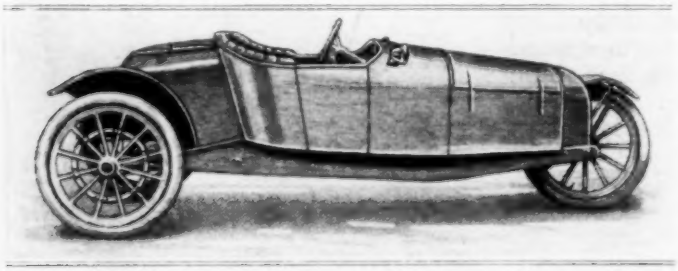
Machine Gun with Folding Tripod by Which It may be Carried on a Man's Back: The Man in the Photograph is Carrying the Tripod Alone

EFFECTIVE SAFETY-FIRST AD IN COMIC SECTION

The colored comic section of the Sunday paper, which is so popular with children and some of their elders, was utilized very effectively in a recent safety-first campaign in Kansas City, conducted by the local traction company. The lower half of the back page of this juvenile section of a Kansas City journal was occupied by eight colored pictures showing eight ways in which a child is apt to be careless around street cars. Anyone familiar with the habit which little children have of asking that the pictures in the comic supplement be fully explained to them, will readily see how effective these advertisements must have been.

VACUUM CLEANER A FEATURE OF NOVEL MOTOR VEHICLE

Embodying several rather distinctive characteristics, a three-wheeled motor carette has made its appearance. It is driven by a twin-cylinder engine of the motorcycle type, which gives it an approximate maximum speed of 45 miles an hour on good roads. The wheelbase is 100 in., the weight 500 lb., the body streamline, and the price low. Roomy storage space for luggage is provided beneath the hood and seat. Roller-drive transmission is employed, which means that the customary differential, clutch, and gears are eliminated. Steel driving rollers on the crankshaft extensions grip V-shaped rings fastened to the rims of the rear wheels, the engine being mounted behind the seat. There are three forward, and one reverse, speeds. To prevent the entrance of dust and grit into the carburetor, the air taken in by the latter is filtered. By attaching a hose with a suitable nozzle, a vacuum cleaner is provided. This is not merely

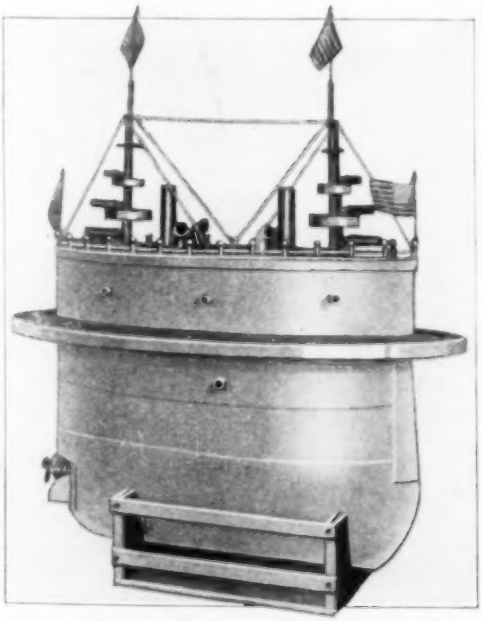


All of the Space beneath the Hood Is Available as a Storage Compartment for One's Luggage

strong enough to clean the upholstering of the car, but may be employed for general purposes, even commercially if desired.

INVENTOR'S MODEL OF AN UNSINKABLE WARSHIP

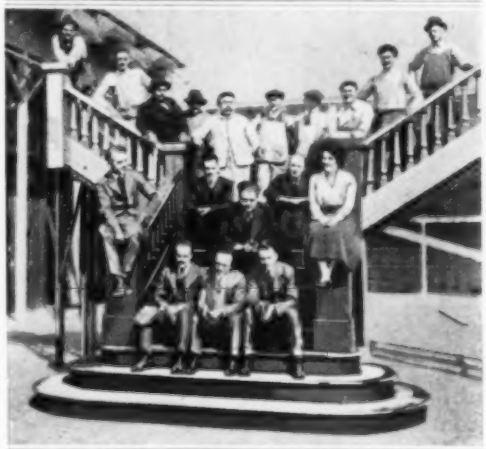
A young inventor of Lancaster, Pa., has constructed a model of what he believes to be an unsinkable warship, able to defy submarines and turn torpedoes from the strict path of duty. His working model shows a sort of semisubmerged fort, the great bulk of the ship's hull being under water at all times. The design of the hull shows extraordinary depth, and the inventor's theory is that this construction, with numerous air chambers, would keep the ship afloat even if struck by one or more torpedoes at or near the water line. A belt of air chambers, resembling a huge flange, surrounds the hull near the normal water line, and is designed to assist in maintaining buoyancy after the lower hull has been pierced and partly water-filled by torpedo attack or shell fire.



Model of Warship Hull Designed by a Young Inventor to Remain Afloat, Supported by Its Air Chambers, after Torpedo Attack

MOVIE STAIRCASE BUILT IN SEVEN MINUTES

Rapid construction of scenery and "props" is often necessary in a motion-picture studio, but four stage hands in



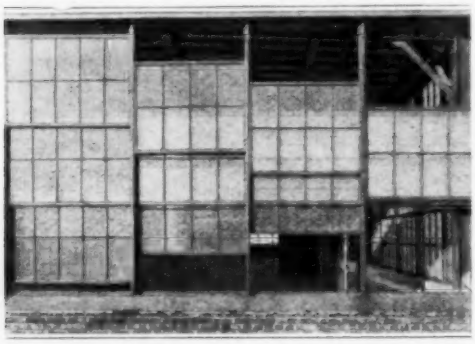
This Demountable Staircase, Used for Various Purposes in a Motion-Picture Studio, was Set Up in Seven Minutes

a Los Angeles studio claimed a speed record when in seven minutes recently they set up a ballroom staircase capable of sustaining a weight of over two tons. In further proof of their ability as lightning-change artists, they then took down the staircase in six minutes, and in seven minutes more transformed the structure into a tenement staircase for another picture. The demountable staircase was invented by one of the studio staff and can be rapidly changed into a dozen different structures, including a banquet table and other large pieces of furniture used in making film pictures.

FIREPROOF STEEL SASH IS FORMALLY TESTED

An interesting test of fire-resisting steel sash was made recently at the underwriters' laboratories in Chicago, during an official visit of the Illinois chapter, American Institute of Architects. A large section of the fire sash, containing 48 lights, was submitted to the test. It was of counterbalanced

type, three sash high, the upper and lower sash being balanced over a pair of pulleys, so that the upper sash descends as the lower sash is raised.



Type of Three-Sash Windows of Counterbalanced Steel Sash Which Withstood Continuous Blazing Heat for an Hour in a Test before Illinois Architects

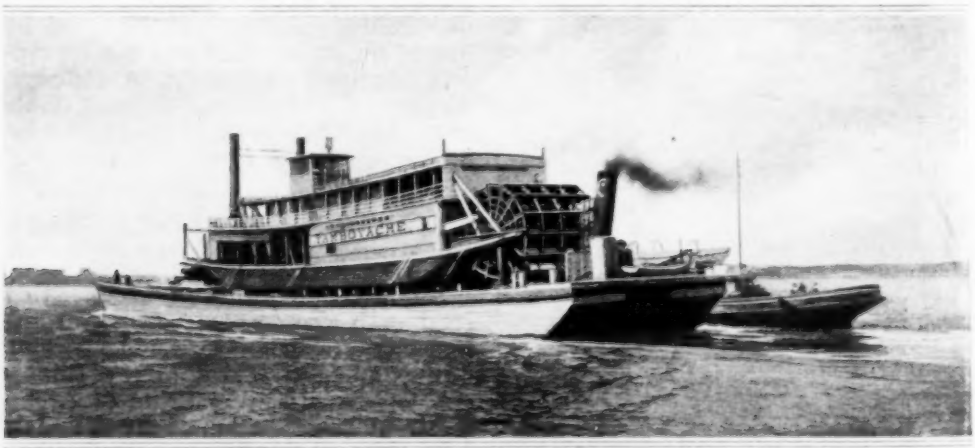
This type is designed to give a great ventilating area in industrial and other buildings, without interfering with the use of shades, screens, or machinery placed close to the windows. The sash is made of steel specially rolled in solid one-piece sections, each of shape and weight to give maximum strength and stiffness, with joints that resist corrosion and are welded by the oxy-acetylene process. Wire glass is commonly used for glazing. In the formal test before the architects the conditions were similar to those of a fierce factory fire, and the sash stood the test for the prescribed period of one hour.

AUTOS SENT IN CARAVANS DURING FREIGHT TIE-UP

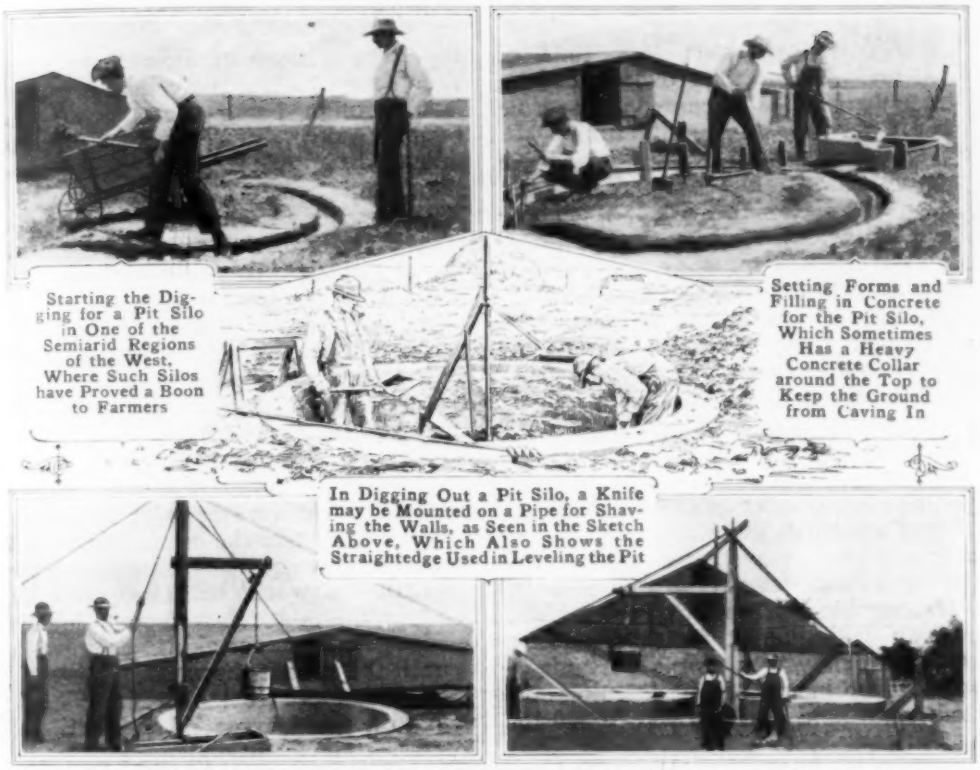
Caravans of a new and modern sort were a familiar sight in various parts of this country while the congestion of freight traffic made it impossible for the railways to handle goods with certainty as to delivery. These processions consisted of long lines of new automobiles sent overland under their own power to agencies in large cities and, in some cases, direct to purchasers. The drivers of the cars were sometimes organized into companies, each of which was commanded by a "captain." It is said that for several weeks an average of 200 cars per day followed the route from Detroit to Chicago.

RIVER STEAMER LOADED ON ITS BARGE

On the completion of a flat-bottomed river steamboat and a large barge, built at Lake Charles, La., recently for the Mexican trade, the problem of transporting them to Mexican waters was solved by loading the stern-wheeled boat on the barge, which was then towed to Tampico. The steamer, fully equipped, was supported on a cradle of timbers built above the hold of the barge.



This Shows How a Stern-Wheel River Steamer, Built at a Louisiana Port, was Loaded on Its Barge to be Towed to Tampico, Mexico, Where It will be Placed in Freight Service



Left: A Completed Pit Silo, with Derrick Rigged for Drawing Out Earth, Lowering Cement Plaster, and Hoisting Silage. Right: Twin Pit Silos near Cheyenne Wells, Colorado

PIT SILOS HELP FARMERS OF THE WEST

Farmers in the semiarid regions of the West have recently found a valuable aid in the pit silo. This form of silo may be cheaply constructed by the farmer himself and enables him to provide satisfactory feed for his stock in winter, even after a season of drought and crop failure. The pit silo is simply a hole in the ground, lined with cement, and may be made of any size or shape. Sometimes a heavy concrete collar is constructed around the top, to keep the ground from caving in and keep the moisture out; sometimes there are concrete extensions above the ground level.

A wooden top is provided, with an opening and some sort of derrick for the removal of the ensilage. The cost of a pit silo may range from $5 for a crude small one to $150 for large ones. The average cost of hundreds already built in the West is said to have been between $15 and $20.

IMPROVED SPOTLIGHT BRACKET

An improved bracket is now being used to attach a spotlight to an automobile windshield, which is of special advantage because it permits the lamp to be turned in practically any direction, either forward, to the right, to the left, or to the rear. This is made possible by means of a T-swivel which turns 270° in a sleeve that is attached to the lamp and through a complete circle in a sleeve attached to the windshield. The cord passes through the swivel, which is hollow.

BUILDING A LOOKOUT ON MT. ST. HELENS

By R. H. CHAPLER

HOW to transport four tons of building material over the three and a half miles of snow fields from the timber line to the summit of Mt. St. Helens, Wash., was the problem propounded to the rangers of the Columbia National Forest when the Forest Service decided to locate a fire-lookout station on that ice-crowned peak last summer.

The 12 by 12-ft. lookout house was purchased ready cut, in a knocked-down condition, so no unnecessary lumber or material would be transported up the mountain, which rises to a height of 9,750 ft. above sea level. The first 55 miles from the railway point to the timber line were made by wagon with little difficulty. From here a simple gravity system of transportation was used, consisting of two sleds, 6 ft. long by 2 ft. wide and 4 in. high, and an 18-in. block with connecting cable, which was a single galvanized wire. Two men coasting down on one sled could haul up from 200 to 300 lb. to the load.

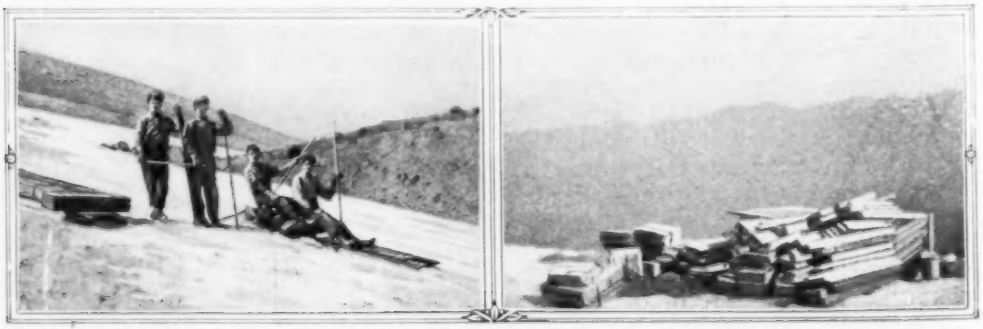
The snow route up the mountain was broken by crevasses and outcroppings, so the work of transportation naturally resolved itself into a series of sleddings and portages. A mile of wire was carried along and cut to fit each setting. The entire material was moved at each setting, or packed around the crevasses, as the case might be.

Transporting the material by this method, the three and one-half miles from the timber line to the mountain top kept a six-man crew busy more than four weeks. This includes time lost through being stormed off the mountain five different times. A 70-mile-an-hour wind is not unusual on the mountain, and at one time the two 7 by 9-ft. tents used to house the crew were literally torn to pieces in a storm. Oil stoves were used for cooking, and baking-powder bread, rice, and coffee were the principal diet.

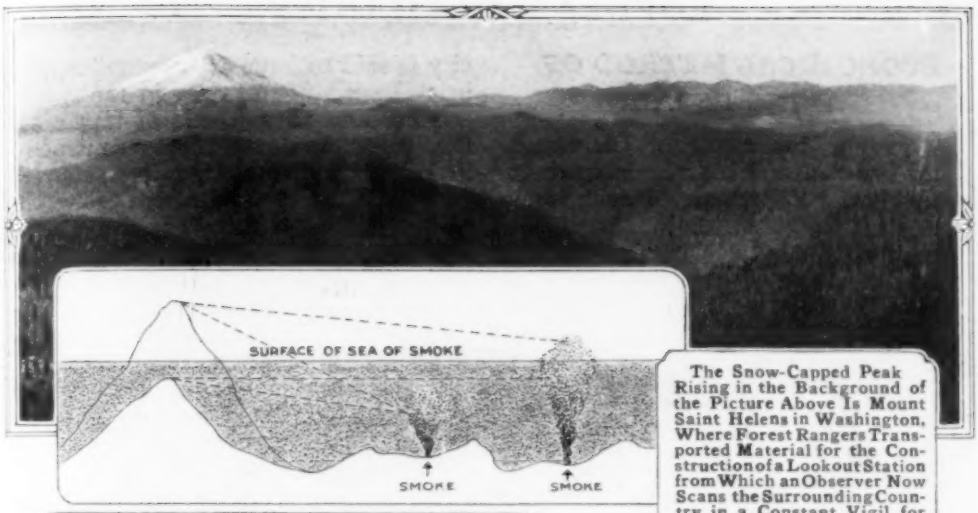
Besides the matter of moving the material up the mountain side the rangers had to keep a constant watch for rolling rocks, which were continually breaking loose from the exposed rim of the old crater near the top and crashing down the steep slopes. There was not a man in the crew who would not rather have quit any time than gone on with the work, but they were of the type that, once started on a difficult or dangerous undertaking, stay with it until they see it through.

Lookouts are replacing fire patrolmen to a great extent in the national forests. The remarkable results obtained from the lookout on Mt. Hood, Ore., in 1915 and 1916, proved the value of the higher peaks for lookout purposes.

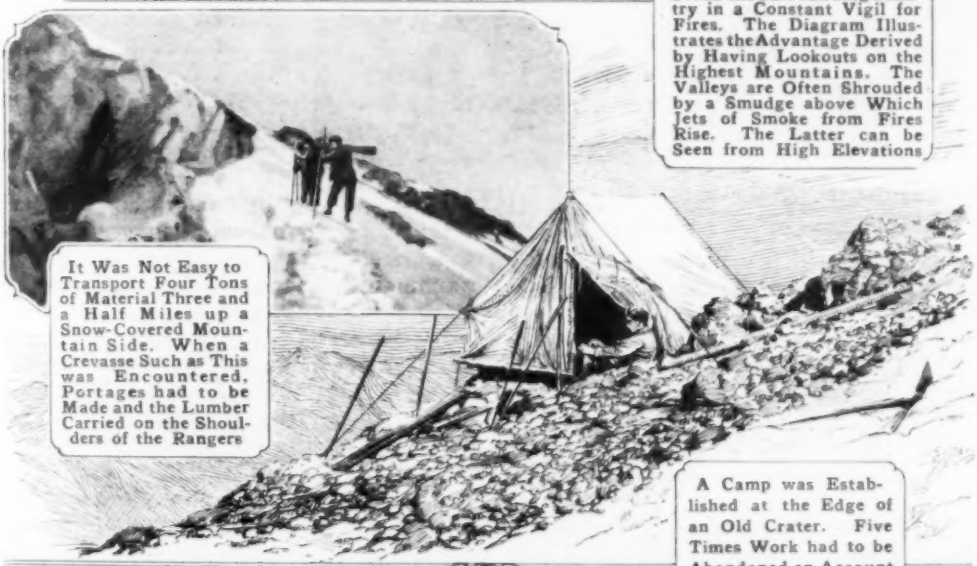
The lookout house on St. Helens will shelter a man who will spend the fire season at the top of the mountain, reporting fires and suspicious smokes, by telephone, to the district chief. He will melt snow for drinking and cooking purposes, and coal-oil stoves will be used.



Left: Drawing Lumber up the Mountain by Coasting down Grade on a Rock-Loaded Sled. The Other Picture Shows the Material Piled at the Halfway Point after Days of Strenuous Work in the Cold and Snow



The Snow-Capped Peak Rising in the Background of the Picture Above Is Mount Saint Helens in Washington, Where Forest Rangers Transported Material for the Construction of a Lookout Station from Which an Observer Now Scans the Surrounding Country in a Constant Vigil for Fires. The Diagram Illustrates the Advantage Derived by Having Lookouts on the Highest Mountains. The Valleys are Often Shrouded by a Smudge above Which Jets of Smoke from Fires Rise. The Latter can be Seen from High Elevations



It Was Not Easy to Transport Four Tons of Material Three and a Half Miles up a Snow-Covered Mountain Side. When a Crevasse Such as This was Encountered, Portages had to be Made and the Lumber Carried on the Shoulders of the Rangers

A Camp was Established at the Edge of an Old Crater. Five Times Work had to be Abandoned on Account of Severe Storms, and on One Occasion the Wind Tore the Tents into Shreds. Oil Stoves were Used for Cooking

When a Sled was Drawn Up to the Pulley, It was Relieved of the Lumber, Loaded with Rocks, and Employed in Pulling Up the Other One. This Was a Slow, Tiresome Process, but It Did the Work. At Times the Men were Kept Alert Dodging Bowlders Which Rolled Down from the Crater's Edge

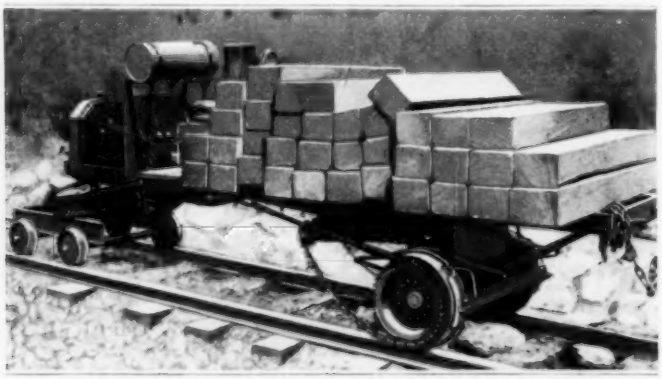
ECONOMICAL METHOD OF PAVING REPAIR

A paving contractor of Cleveland, Ohio, has reduced his repair gang to two men and a foreman for such work as is shown in the illustration, where a brick pavement is to be patched. The city is said to have a larger mileage of brick than any like area in the world, and economical methods of repair are therefore important. This contractor first has all the old paving removed with pick and sledge, except along the edge of the patch. There the old bricks are loosened for removal, with a pneumatic chisel. This cuts out the old mortar and leaves a clean sound "key" for the new pavement to meet as it is laid. The sound bricks taken up are also cleaned by the pneumatic tool and relaid, which is another economy. Power for the tools is furnished by a portable outfit consisting of a gasoline engine and an air compressor mounted as a unit upon a truck that can be moved along the pavement by hand.

Cleaning Out the Old Mortar to Patch Brick Pavement in Cleveland: A Pneumatic Chisel is Used, with Power Furnished by the Air Compressor alongside the Patch, and One Man can Do the Work of Three with Hatchets

AUTOMOBILE DOES DUTY AS A LOCOMOTIVE

In building a mining railroad up a steep cañon in Utah recently, the construction engineer found it slow and expensive to haul ties and rails by team up the cañon grade. He therefore secured a small automobile, removed the wheels, and placed small railroad trucks under the chassis, with large sprockets on the rear wheels, to which power was transmitted from the regular automobile rear axle by a chain. The transformed machine worked like a charm when used as a locomotive on the new-laid tracks of the railroad, taking a grade of 11 per cent, with a load, at about 12 miles an hour. A load of two tons was carried up the cañon easily on high gear, and the engineer asserts that his newfangled locomotive will haul as many ties and rails in one day as a four-horse team could haul up the cañon in ten days. The gasoline tank is carried above the dash.



Automobile Engine and Chassis Transformed for Use as a Locomotive and Freight Train in Railroad-Construction Work

View in Tufts College Laboratory, Showing Professor and Assistants Preparing Scores of Bodies of White Rats for Biology Students

WHITE RATS BY THE SCORE FOR BIOLOGY CLASS

With almost the precision of a window dresser making ready trays of goods for display, a professor in Tufts College, Massachusetts, arranges the bodies of white rats in large shallow pans, this being one of his tasks in preparing work for his biology class. The little white carcasses, arrayed in this unusual manner, are used by the students in their study of veins and arteries and their location. The accompanying photograph shows the professor and an assistant injecting colored fluids into the rats, so that the blood passages and their connections with the various organs can be studied to the best advantage. The man in the background is giving the specimens a final cleansing.

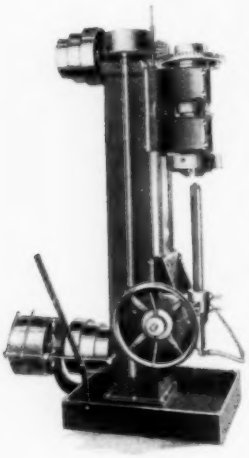
ORNAMENTAL FIRE ESCAPES FOR NEW BUILDING

Fire escapes, even on very handsome structures, are often an ugly feature, but in the case of a new insurance building in Los Angeles they have been so designed as to be truly ornamental. The landings of these emergency stairs at each floor are handsomely embellished balconies, finished in the same color and material as the rest of the building. Extending from one balcony to the next are railed flights of iron steps, painted a light color to match the rest of the exterior.

Two Views of the Fire Escape on a New Building in Los Angeles, so Designed as to Be Truly Ornamental

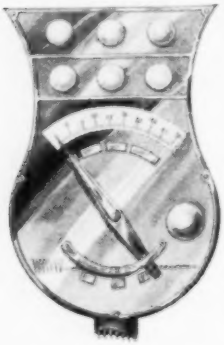
NEW DRILLING MACHINE FOR DEEP HOLES

A machine lately placed on the market is designed to furnish a ready means for drilling the long or deep holes required in lathe spindles and similar work. The drill is set in a vertical position and feeds up into the work. This arrangement prevents the drill from becoming clogged with chips, and a small force pump, included in the equipment, keeps it cool and free from obstruction. Holes of any size up to 4-in. diameter and 48 in. long can be drilled rapidly, the drilling being done from both ends when the hole to be made exceeds 24 in. in length. The feeding mechanism is adjustable by means of removable gears furnished with the machine.



AUTO SPEED INDICATOR LOCKS ON COLLISION

Should an automobile collide with another car or any other object head-on, the speed at which it is traveling at the moment of collision may be registered by a device recently patented by a Seattle inventor. The means employed include a speed indicator with the usual dial and a pointer which is locked by electricity in any position it occupies when a switch mechanism is closed by pressure on a collision bar carried on the front end of the automobile. The pointer is engaged and locked by a plate supported above it normally by a bar, the latter being withdrawn electrically when a collision occurs, so that the pointer cannot move from the position it occupies at that moment, but remains fixed as evidence of the rate of travel, which often decides the responsibility for accidents.



LIGHTING A GAS LANTERN WITH A MATCH

A recent improvement enables a gasoline lantern to be lighted with a match, outdoors and in any kind of weather. It eliminates the necessity of carrying around a torch and alcohol to start the generation of inflammable gas. A small coil located near the gas mantles and conveniently reached by the flame of a match inserted through a small door in the reflector, is the special feature of the improvement. The heat of the match applied to this coil is sufficient to generate gas and light the lantern in about 15 seconds. As the gasoline lantern is claimed to give more light than 20 kerosene lanterns, and can now be lighted with a match in the wind or rain, its use among farmers, watchmen, campers, and automobilists is likely to be greatly extended.

COLLAPSIBLE BOAT TESTED BY FOREST SERVICE

One of the Pacific coast divisions of the Forest Service has been equipped recently with a new style of collapsible canvas boat, which is being tested in the vicinity of Olallie Butte, Ore., where the national foresters are co-

Canvas Boat Supplied to Members of the Forest Service Engaged in Planting Game Fish in Oregon Waters: When Not in Use the Boat Folds Up

This Shows How Easily the Folding Canvas Boat, with Its Oars, can be Carried by a Man

operating with the State Game and Fish Commission in planting game fish in navigable streams. When in use, the boat is 12 ft. long, with a 3½-ft. beam, folding seats, and two-piece oars. It folds into small compass for insertion into a canvas bag of convenient form for transportation either by hand or on horseback. The total weight when folded and packed is 50 pounds.

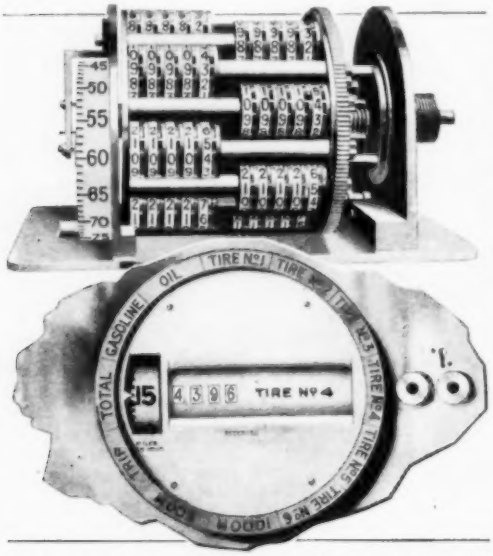
AMERICAN COLD STORAGE FOR FOREIGN TRADE

Representatives of a New York refrigerating firm are reported to have been in Petrograd recently, consulting with government officials regarding the construction of ten large cold-storage warehouses on the Siberian and southeastern railways of Russia. Since imports from Germany ceased with the war, a great need for refrigerating plants and machinery has developed in Russia, and American manufacturers have been invited officially to bend all their efforts to the satisfaction of the empire's wants, with promises of a reduction of import duty on refrigeration machinery and prospects of a largely increased market in Russia for American food products. The need for cold-storage and refrigerator cars on Russian lines of transportation is realized by American packers, who are also turning their eyes to India and planning the erection of cold-storage plants for American products there.

METER DEVICE INDICATES MILEAGE OF TIRES

The amount of mileage obtained from each tire used on an automobile, and from spare tires when these are in service, is recorded by an instrument just placed on the market by a Pennsylvania manufacturer. It also performs the usual functions of recording devices, indicating the car speed, trip mileage, and season mileage, besides showing the total gasoline consumption and oil consumption, and giving warning of adjustments, repairs, or cleaning usually found necessary at the end of every 500 and every 1,000 miles of car travel. It thus gives 13 separate readings regarding the service

of the car. With the exception of the car speed, which can always be read on the dial of the instrument, the other readings are obtained by turning a



Dial and Mechanism of Auto Recording Device Which Tells the Mileage Obtained from Individual Tires and Keeps Track of Gas and Oil Consumption

movable dial ring, marked in various spaces with names or catchwords for the different records. When one of these names is brought opposite an adjustment thumbscrew on the face of the instrument, and the screw is turned, the appropriate record appears on the dial.

GOVERNMENT DESIRES DATA ON METALS AND ALLOYS

For the purpose of making the information generally available, the Bureau of Standards is compiling data concerning the numerical values expressing properties of metals and alloys, as used by engineers and others. Representative and fair figures for technical use of the material under consideration rather than extreme values, such as the maximum tensile strengths of metals, are desired. In carrying out the work engineers and engineering firms, scientists and scientific institutions, as well as those in allied fields, are being called upon to coöperate. To facilitate this, form sheets and instructions are being distributed. Some of the alloys for which information is desired are aluminum and its light alloys with zinc, copper, and other metals, of stated percentages; nickel and copper-nickel alloys; aluminum, manganese, and phosphorus bronzes; naval brass and marine bronze; the red and other brasses, and white metals. The list of properties of which average values are sought include the density, shrinkage, tensile strength, yielding point, elastic limit, reduction of area, hardness, behavior in compression, melting range, expansion, conductivity, and hydraulic and optical properties of special metals and alloys.

RELIEF PIPES FOR IRRIGATION LINES

In developing certain arid parts of the West it has been found most practical to carry water used for irrigation purposes through underground pipes instead of ditches. One of the accidents which has to be guarded against in such irrigating systems is the bursting of pipes by forcing water into them under high pressure when the outlet valves have accidentally been left closed. To prevent such damage a common practice is to erect what are called relief pipes at certain intervals along the pipe lines. These rise to such a height in the air that when the outlets are open no water flows out of them, but in case a line has been closed through oversight, the vertical extension serves as an outlet, thereby preventing damaging pressure in the pipes underground.

A CONCRETE MOUTH FOR AN OCEAN INLET

By STANLEY W. TODD

CERTAIN small rivers along the north Atlantic coast, emptying into the ocean, have a habit of closing their inlets whenever northeast storms and flood tides shift the sand bars. Invariably, stagnation of the river water follows, producing insanitary conditions in the territory touched by the stream and killing river oyster beds and the fish as well. The closing of the inlet, therefore, presents quite a serious problem to the river communities.

Remains of Wooden Jetties Built to Protect the Inlet to the Shark River on the New Jersey Coast, Showing What the Sea has Done to Them: The State is Now Building a Concrete Inlet Mouth

The ocean front between the summer-resort towns of Belmar and Avon-by-the-Sea, N. J., for instance, is divided by the inlet to the Shark River, which opens into an expansive bay in the country behind. The continual shifting of the inlet has made it impossible to bridge the gap, thus cutting off a coast-line highway to the towns lying north. In former years, the inlet closed frequently and produced such insanitary conditions that the county made an attempt to remove the trouble. As a result, the plan of a Pennsylvania professor, devised to meet the situation, was adopted. This consisted of an elaborate system of wooden jetties on both sides of the river mouth, backed up by sand. The jetties were put in after a good deal of difficulty and expense, and served for several years, until the sea got in its work. It pounded out the sand backing and loosened the piling, putting the inlet again at the mercy of wind and waves.

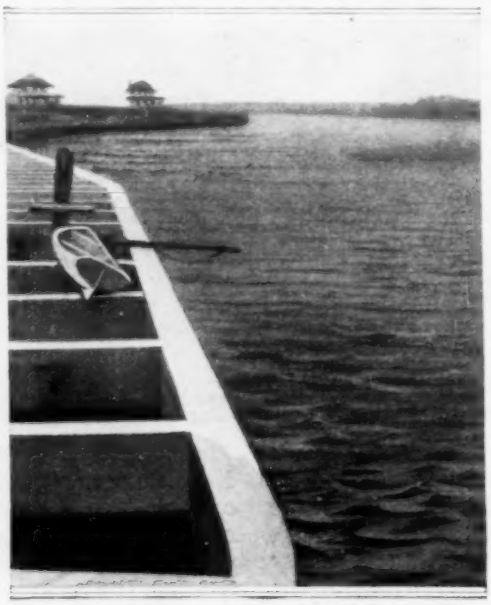
Then the state of New Jersey took a hand in the matter. A New York engineer conceived the idea of installing a concrete mouth for the river, following the natural course of the water instead of running straight out, as the wooden jetties did. The state appropriated a sum of money and the work was undertaken two years ago. A plant for making reinforced-concrete piles was set up near the inlet, also a pumping station for water jets used in making way for the piles in the bed of the river.

North Wall of the New Concrete Inlet to Shark River, Showing the Trestle Used in Placing Reinforced-Concrete Piles Made at a Special Plant Set Up on the Neighboring Shore

But the original contractors failed and the task of carrying out the improvement fell upon the state, whose Department of Conservation and Development directed the operations through a receiver. The work is now nearing completion.

When the project is finished, the Shark River inlet will have a concrete "mouth" about 100 feet wide. On each side, there will be a reinforced-concrete wall, formed by 24 and 28-ft. piles, of the tongue-and-groove type, with the base sunk several feet in the clay underneath the sand. Besides, the contour of the walls follows the natural flow of the water, keeping the inlet at a standard depth.

The ties which make up the inlet walls are in some cases solid concrete, and in others hollow. They are capped with 2-ft. beams and reinforced with brace bars, 10 ft. 8 in. long.



Concrete Inlet for the Shark River at Belmar, New Jersey: The Contour of the Walls Follows the Natural Course of the Water and is Designed for Protection against Shifting Sands

It was soon discovered that ordinary pressure on the water jets would not be sufficient to remove the thick clay encountered under the sand, and 100-lb. pressure was secured. The north wall had to be strengthened, particularly where it reaches out into the ocean. A solid reinforced-concrete wall, at least 6 ft. wide, has been built out into the sea for about 150 feet. This bulkhead has the effect of protecting the south side of the inlet by holding back the sand that used to close it up periodically. The sand bar shifts outside of it, instead of blocking the river, and the channel is thus maintained.

All the engineering equipment was erected by the contractors on the Belmar side of the inlet and so trestles had to be constructed to bring the necessary power to the Avon shore. These trestles had to be strong enough to hold a 60-ton locomotive crane. They are built in a sort of semicircle, and then run parallel with the concrete work.

The crane, moving about on the track, greatly facilitated the task of bringing over the heavy concrete piles from the other shore and doing other heavy work. Another trestle was found to be necessary, to carry the pipes conveying water under 100-lb. pressure from the engine room on the Belmar side to the water jets operating on the other side of the inlet. A 5,500-lb. steam hammer was also used in these operations.

It is proposed to construct a bridge over this concrete mouth, allowing the continuance of the shore road to the next town. Other contemplated improvements include the development of vast sand wastes for dwelling purposes, similar to a very remarkable draining and filling-in work consummated farther up the river. In the latter case, former mud bars and swamps were filled in and leveled, and are now the center of a summer-home section, made attractive by a system of lagoons.

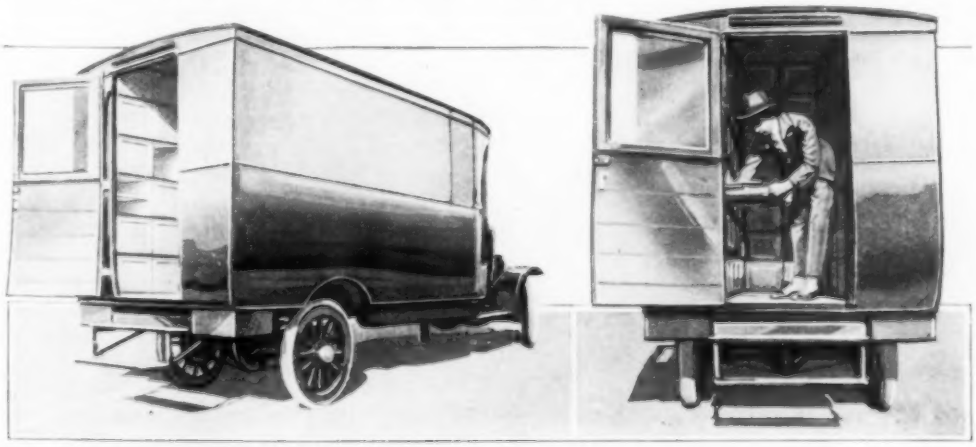
Upon the successful termination of the Shark River inlet experiment depends the fate of several rivers along the New Jersey coast and the Long Island ocean beaches affected by similar conditions. Never before has concrete been applied to river inlets in

Details of Concrete Inlet Wall at Belmar, New Jersey, at the Left. The Photo at the Right Shows the Swift Current of the Rushing Tides, Which Made the New Structure Necessary

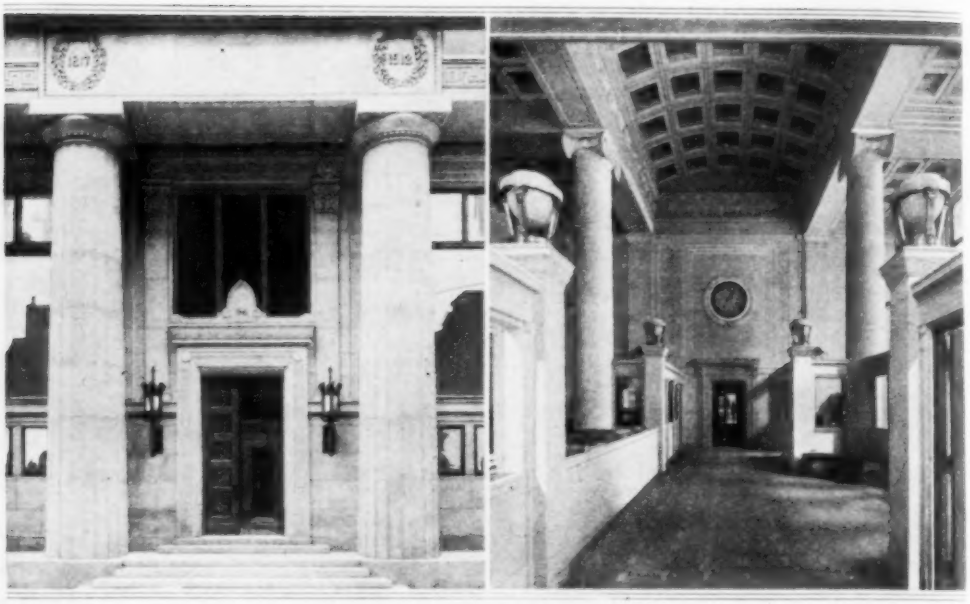
this way, and if the undertaking is considered a success by engineers, it is probable that similar improvements will be made in other streams hampered by shifting and uncontrollable inlets.

TRUCK USED AS TRAVELING NOTION STORE

With a view to making deliveries of goods as soon as an order has been received, a wholesale-notion company in Pasadena, Calif., has purchased a truck equipped with more than 100 compartments, ingeniously arranged to utilize all available space. The car can be entered from the rear by opening the door which allows folding steps to drop into place. Through its center runs an aisle, on each side of which are 48 commodious compartments, while at the front end of the passage are 12 more drawers. At the back side of the driver's spacious compartment, in which there are seats for five persons, are six drawers, and overhead are five more, one of which is attached to the windshield. A sliding glass panel gives the driver a view of the car's interior. Four storage spaces, fastened to the under side of the car floor, are accessible from the outside. A ventilator is provided above the rear door.



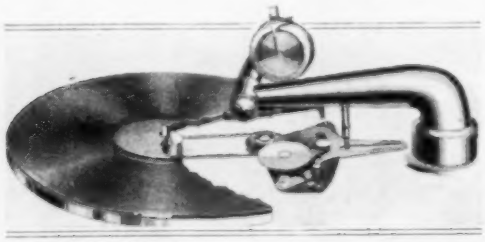
Two Views of a Truck Having More than 100 Storage Compartments: With It a Drummer for a Wholesale-Notion Company Is Able to Deliver Goods at the Time He Makes His Calls



Exterior and Interior Views of the Home of a Philadelphia Fire-Insurance Concern Which has Practiced What It Preaches by Making the Structure Thoroughly Fireproof

DEVICE STOPS PHONOGRAPH WITHOUT SETTING

A mechanical device newly patented automatically starts and stops a talking machine without any special setting or adjustment. It can be applied to any phonograph, old or new, and replaces the regular brake without altering the instrument. Its construction and operation are simple, there being only two working parts, located under the turntable. When the tone arm is swung into position for playing a record, the movement of the device starts the motor; when the record is finished, the motor is automatically stopped.



Automatic Start and Stop for Phonographs, Replacing the Regular Brake and Requiring No Setting

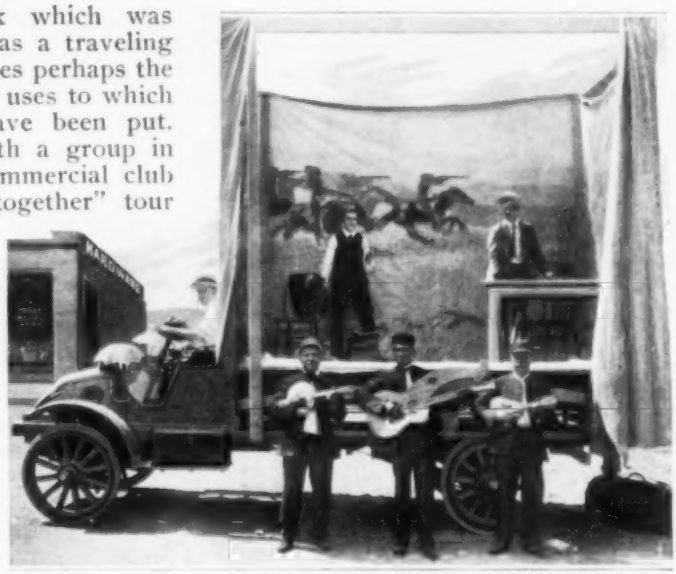
FIRE-INSURANCE CONCERN'S OWN HOME IS FIREPROOF

Acting on the principle that a fire-insurance company's own home should be an embodiment of the very latest ideas in fireproof construction, an insurance association in Philadelphia has constructed, and is now located in, an office building that fulfills the rigid requirements of the fireproofing engineer and at the same time possesses much architectural beauty. The tessellated floors, polished columns, walls, and paneled ceilings are all of material that would resist flames. Yet in providing for building materials which were strictly fireproof, the architect has avoided all suggestion of harshness. Instead, the design possesses beauty and strength that are most attractive.

¶A commercial organization in central Europe is said to have drawn up plans for a tunnel under the Bosporus. If such an improvement were actually constructed it would be a tremendous stimulus to land commerce with the near East.

TRUCK USED AS TRAVELING VAUDEVILLE STAGE

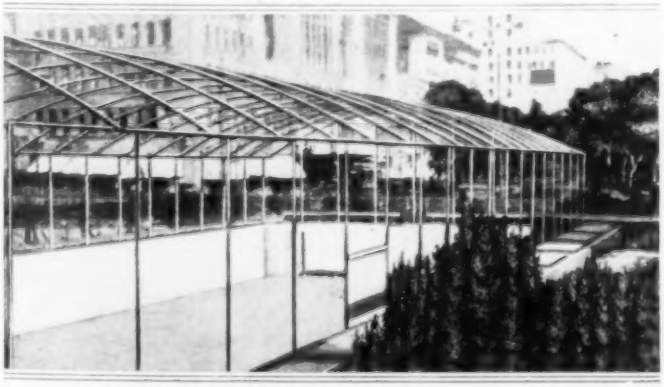
An automobile truck which was fitted up not long ago as a traveling vaudeville stage illustrates perhaps the latest of the many novel uses to which self-propelled trucks have been put. The idea originated with a group in a Kansas City, Mo., commercial club which planned a "get-together" tour through several neighboring towns and wished to supplement its program of outdoor speeches with vaudeville features to attract the people. To meet these special requirements a one and one-half ton truck was secured and a platform built upon it to serve as a stage. A knockdown framework was also constructed, which was carried on the platform, and when the little company of speakers and entertainers arrived in a town this was quickly set up and the platform surrounded with canvas walls. Across the front of the stage hung a draw curtain, while the background consisted of an animated western scene painted in colors. A few pieces of furniture completed the setting.



Automobile Truck Fitted Up as a Vaudeville Stage and Part of the Company of Entertainers That Accompanied It: The Upright Framework is so Made That It can be Quickly Taken Down or Set Up

DOWN-TOWN PLAYGROUND FOR NEWSBOYS

In the heart of Los Angeles, opposite Central Park, a church has equipped a playground for newsboys, and others who have few recreation facilities. The patrons range from 8 to 18 years of age, and many of them are of foreign birth. The area, which is inclosed with wire netting, is open evenings and during the day on Saturdays, when athletic games are played under the supervision of a director or volunteers representing the church. The playground has been established with a view to providing a wholesome substitute for the undesirable pastimes that occupy the attention of many boys in down-town districts.



Playground in the Down-Town District of Los Angeles, Equipped and Maintained by a Church for the Benefit of the Newsboys

SMOKE ROOM AND TOWER FOR FIREMEN'S DRILL

At the base of a large frame tower in Pueblo, Colo., on which the firemen hold frequent drills, is the "smoke room," which is practically air-tight and in which at stated times old papers, rags, etc., partly saturated with formaldehyde, are placed and set on fire. When the room is filled with fumes and smoke the firemen, wearing their gas helmets, rush in to make their "rescues." By this means the men have developed great skill in this sort of work.

Firemen's Practice Tower in Pueblo, Colorado, with a Room That is Occasionally Filled with Smoke so That the Men can Practice Rescue Work

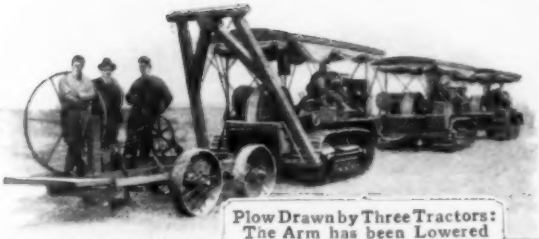
COMMON FERN STEMS AS A SOURCE OF STARCH

An English scientist has suggested that the underground stems of the common fern may be used economically as a source of starch. These stems are simply packed with starch, according to this authority, and others agree with him that the bracken fern, or brake, which grows abundantly in many climates, might be made to furnish starch for industrial use if the roots or rhizomes containing the starchy element could be collected at small cost. It is said that a coarse kind of bread has been made heretofore from the roots of the brake fern in certain northern climates, and that in the East Indies and Polynesia the rhizomes of several fern species are eaten as a starchy food, or have the starch extracted from them. Experiments will probably be made in England to determine the economic value of the fern in this respect.

COMBINATION CUSHION AND LIFE PRESERVER

A silky vegetable fiber that weighs much less than cork is used as a filling for a type of life preserver which is so made that it serves as a cushion also. The article is especially suited for motorboats and other small craft. The life preserver is made up of two sections hinged together and provided with suitable straps. For use as a cushion it is inclosed in a slip-on khaki-duck cover, equipped with snap fasteners. It weighs but 2 lb., and the makers assert it has ample buoyancy to keep any person afloat. The cushion, if submerged, will retain its buoyancy over 48 hours.

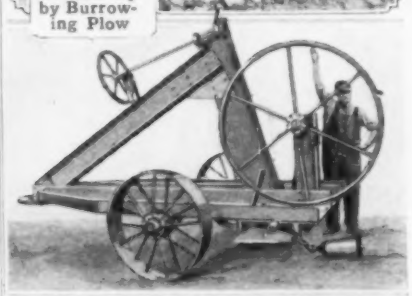
Life Preserver Weighing But Two Pounds, Filled with Silky Vegetable Fiber Which Is Much Lighter Than Cork: In the Rear the Preserver is Shown with a Slip-On Cover Which Makes It Serviceable as a Cushion for a Yacht or Motorboat



Plow Drawn by Three Tractors: The Arm has been Lowered Four Feet into the Earth

Side of Ditch, Showing Condition of Ground after being Broken Up by Burrowing Plow

Plow Backed Up over Ditch into Which Drainage Holes Empty: Lowered Arm Is Ready to Cut Deep Slit through Dirt



Burrowing Plow with Two-Wheel Running Gear: Note Steel Cone Attached to Lower End of Adjustable Vertical Arm

PLOW BURROWS DRAIN HOLES UNDERGROUND

A method of cultivation and drainage combined, which has been introduced on large farms in the West, requires the use of a plow that makes a horizontal hole under the surface of the ground at a depth of several feet, its action somewhat resembling the burrowing of a mole. The implement has a vertical blade that penetrates the earth the desired distance, and attached to its lower end is a steel cone, 8 in. in diameter, which is drawn through the soil by the arm, making a hole with hard-packed walls as it goes. In its progress through the ground the blade loosens the earth either side of it for some distance, and at the same time makes a narrow incision through which water may seep into the hole. It is said that some of these drains will last for years. The burrowing apparatus is mounted on a low running gear and the depth at which it works is regulated by a hand wheel. As many as three tractors have been required to pull one of these plows when the share was at full depth.

METAL CAR TICKETS THAT REGISTER AUTOMATICALLY

Metal street-car tickets have supplanted paper tickets in Mobile, Ala., where the traction company has inaugurated a new system of registering fares. The new ticket for adults consists of a suitably inscribed flat metal ring, encircling a letter "M," which stands for Mobile. Employes are provided with a metal piece bearing the letter "E." Officials and others holding passes are required, on entering a car, to give up a metal ticket marked with a cross. These disks, as well as

New Street-Car Tickets Recently Adopted in Mobile, Alabama: The Center One Sells at the Rate of 22 for $1. The One at the Right Is for Employes and That at the Left for Pass Holders

cents, nickels, and dimes, are deposited in a special fare box which automatically registers them according to their value.

SEA WALL PROVIDES SEATS FOR BEACH HABITUES

One long section of the reinforced-concrete sea wall skirting a magnificent stretch of beach at San Francisco and separating it from a broad esplanade which is to be established, has been completed. A rather striking view of the structure, which on its curved, seaward side is provided with a series of deep steps that are used as "bleacher" seats by the surf gazers, is afforded by the accompanying photograph, which indicates clearly the position of the wall in relation to the future boulevard.

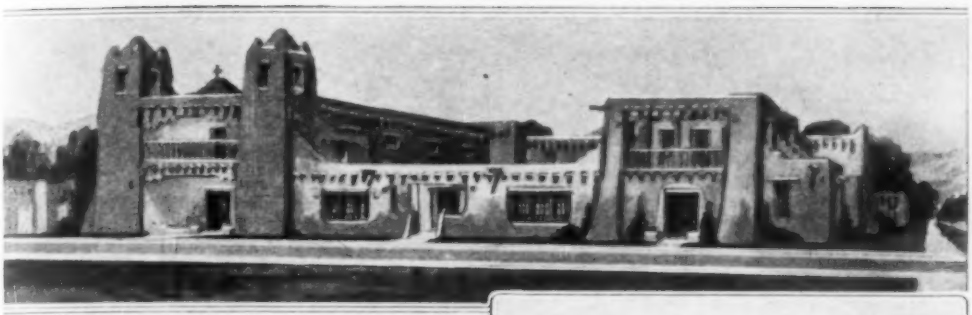
Bird's-Eye View of Completed Section of San Francisco's Sea Wall, Which Protects a Splendid Stretch of Beach

TESTS SHOW HOW FREEZING BURSTS HOT-WATER PIPES

Doubtless many persons other than plumbers have reached the conclusion that pipes carrying hot water burst more frequently as a result of freezing than do those that supply cold water. To determine the truth of this opinion and explain the matter, a system of test tubes was arranged to parallel as nearly as possible conditions presented in the average water-supply installation. The tubes were closed at one end. Some of them were filled with cold water and others with water that had been boiled. In the course of several experiments 44 of the tubes holding boiled water burst, while only four of the others broke. The explanation was found in the fact that while tap water freezes more easily than boiled water, it does not freeze so solidly or exert so great a force in expanding. Unboiled water in freezing produces ice that is filled with air bubbles and is slushy near the middle of the tube. The bubbles and slush tend to react against expansion.

NEW MEXICO MUSEUM BUILT LIKE INDIAN MISSIONS

The new museum building in Santa Fe, N. M., which is being constructed under the auspices of the School of American Archæology at a cost of $100,000, is a fine example of the results of a movement in the Southwest to preserve, as far as possible in new buildings, the distinctive features of the Indian architecture of the region. The new structure is an enlarged replica, in reinforced concrete, of the brick and stucco New Mexico state building at the San Diego fair. It combines the picturesque characteristics of several famous missions, reproducing the balustraded recess of one, the façade of another, and so on. It bears special resemblance to the ancient Spanish mission church at the pueblo of Acoma, N. M.—a massive building of stone, timber, and stucco, having walls 10 ft. thick in some places. The museum will serve as a state civic center as well as an appropriate shelter for rare archæological collections.



Reinforced-Concrete Building in Indian-Mission Style, That will Serve Both as an Archæological Museum and a Civic Center in Santa Fe

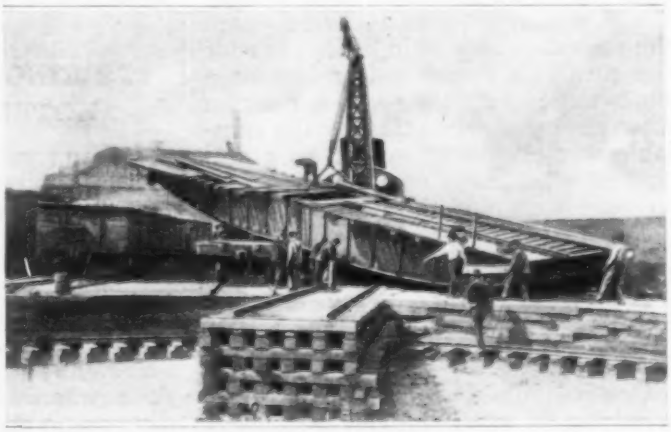
Old Indian Mission Church at Acoma, New Mexico, Which was Copied in Many Particulars in Designing the New Museum Shown Above

An auditorium with seats for 1,000 is provided, also tea rooms, sitting rooms, a kitchen, etc. It is connected by an overhead passageway with the historic government building known as the Palace of the Governors. The formal dedication of the museum will take place in August.

STEEL TURNTABLE MOVED BY WRECKING CRANE

Using a 70-ton wrecking crane to pick up and move a 55-ton steel turntable, an operation recently carried out by a railroad in Chicago, was an unusual proceeding because of the small difference in weight between the crane and its load. In preparation for the work a track supported on cribbing was built out to the center of both the old and the new turntable pit. Supported on the track and clamped to it to prevent overturning, the crane lifted the turntable from its old location by means of heavy chains. With the turntable raised and swung close, so that the boom stood nearly vertical, the crane was backed off the cribbing to a point where the turntable could be swung upon a steel flat car for transportation to the new site.

At the new site the reverse of this proceeding was carried out, except for a variation due to unexpected trouble. As the crane carried the turntable forward, the track sank under the weight, and a disastrous upset was prevented by the crane operator, who on the instant released all clutches and let the turntable fall. One end of it fell on a steel flat car, which in spite of the



Moving a 55-Ton Steel Turntable with a 70-Ton Crane: The Track Gave Way and the Turntable Fell 20 Feet, but the Operation was Completed Successfully. In the Foreground Is the New Pit with Temporary Track and Cribbing

The Mezzanine Balcony Borders the Restaurant on Two Sides and Offers Tables for Some

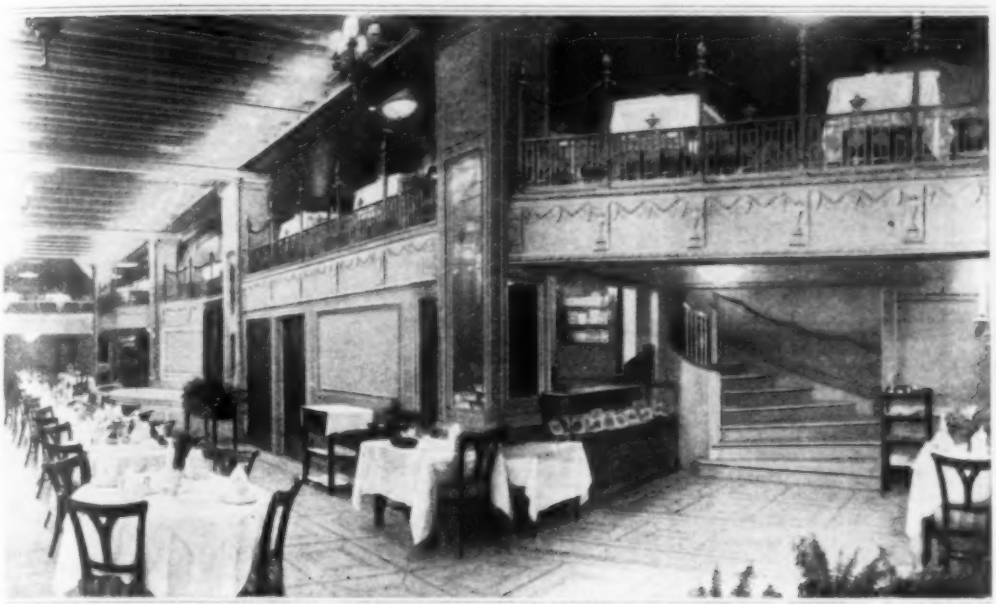
severe impact was not seriously damaged. After the track had been repaired the turntable was lifted clear of the car and lowered to the track. With the crane in position close behind and the boom reaching horizontally ahead, power was then applied through the cables, exactly as in lifting, to slide the turntable ahead a few feet at a time, the crane taking a new position after each pull. In this way the turntable was gradually worked to a section of solid track where it was safe to pick it up and move it to its final position in the new pit.

RAISING OF MORE SHEEP TO IMPROVE LAND

One of the speakers at a recent gathering of retail clothing merchants made a strong plea for the raising of more sheep in this country, declaring that in spite of our growing population there are several million less sheep in the United States today than in 1900. One of the arguments used in urging that this condition be remedied was that sheep are most valuable as fertilizers. It was pointed out that in parts of England in which the soil did not possess great natural fertility, the raising of sheep had supplied the desired properties and the value of the land had increased proportionately.

STRIKING, WELL-EQUIPPED HOTEL DINING ROOM

Italian renaissance decorations, large panels hung with English tapestries, an artistic fountain, and a fully equipped stage are some of the outstanding features of a restaurant that has lately been opened in a new hotel at Cleveland. The room is 90 ft. in length, 40 ft. wide, two stories in height, and overlooked by a mezzanine floor where tables are provided for diners who prefer more privacy than is afforded below. The stage occupies a central position and can be seen from practically all parts of the main floor. Although of small size, it is supplied with footlights, a spotlight, and a projector, so that musical skits, one-act sketches, and moving pictures can be presented creditably for the entertain-



75 Persons. The Columns and Pilasters are Fitted with Mirrors and Finished in Tile

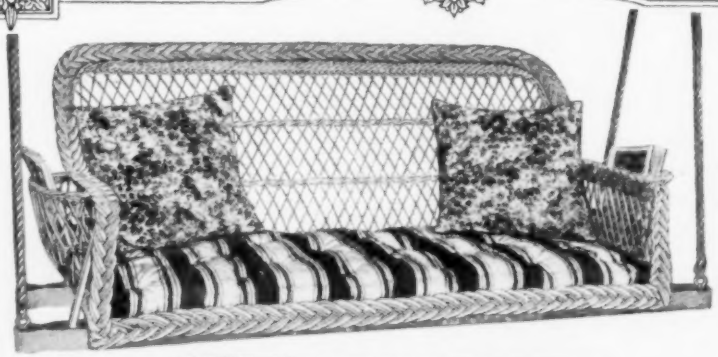
ment of guests. Dressing compartments, and a comfortable room where the performers may rest between numbers, are provided. The dining room is rather a surprising one for a hotel of 300 rooms, and has attracted much comment. The beamed ceiling is ornamented in bright colors, while the chairs are hand-decorated and finished in ivory and blue.

BIG OAK TREE MOVED LIKE A HOUSE

In regions where the winters are cold, it is the common custom, when a large tree is to be moved, to do the transplanting when the earth is frozen about the roots. But California's balmy winters do not admit of such a plan, and so, when the park commissioners of Oakland decided to replace the old oak in City Hall Park, that had died, with a big living oak, they resorted to the means shown in the illustration. The "new" oak's roots and surrounding earth were inclosed in a sort of huge tub, constructed on the spot, and then the task of transporting the tree to its new location was intrusted to a house mover, who used his regular equipment for the job.

Oak Tree, Set in Big Improvised Tub, being Moved Like a House to City Hall Park, Oakland, California, to Replace an Old Oak Which had Died

NEW DESIGNS IN REED FURNISHINGS



Porch Swing with Magazine Pockets at Ends. Cushions of Cretonne or Awning Stripe

Not a Bird Cage but a Novel Cretonne-Lined Shade with Bracket, for Side Lamp

Right: Library Table of Distinctive Pattern, with Convenient Shelf and Pockets

Aquarium Stand, 27 Inches High, Suited for Summer Home or Year-Around Use

Large Reed-Incased Fountain of Waterproof Cement for Living Room or Sun Porch. Sprays Adjustable as to Height

Happy Combination of Reed Bird Cage and Flower Holder. Height About Seven Feet

Day Bed with Box Springs: A Particularly Pleasing Piece of Reed Furniture. Cushions and Mattress Covered with Awning Stripe

ESPECIALLY SUITED FOR SUMMER USE

SOLDIERS USE ARMY TRUCK TO SAW WOOD

Certain United States soldiers on the Mexican border found that the sawing of wood for camp use was a rather arduous task, until one of their number worked out a plan to make an army truck do most of the work. A circular saw, with its shafting, was mounted on a roughly made framework, and thereafter, when wood was to be cut, an idle truck was backed into place beside the improvised equipment. After the rear wheels had been raised up on jacks, one of them was connected with a shaft by a belt and the engine started at the desired speed. Except when the wood was very tough no special attention was given to the motor after it was once set running.

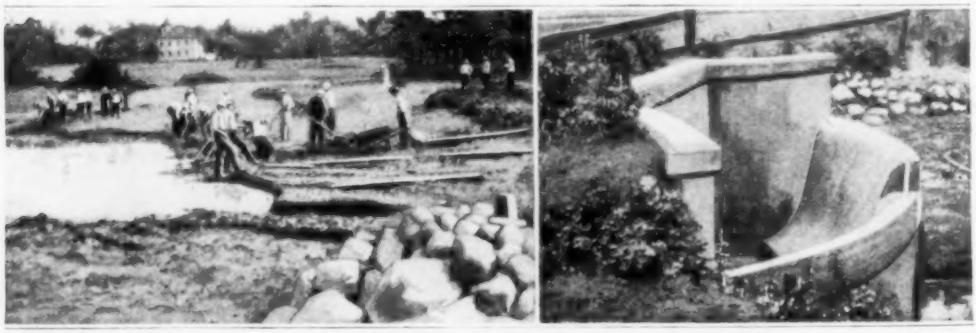
Sawing Wood with an Army Truck: Labor-Saving Arrangement Devised by One of the Soldiers on the Front Which Utilizes One of the Big Cars When It would Otherwise Be Idle

ARTIFICIAL LAKE AND DAMS BUILT BY STUDENTS

At the expense of a loyal alumnus of Iowa State College, the beauty of the campus at Ames has been enhanced by the construction of an artificial lake, most of the work being done by students. A small creek, known as College Creek, was first excavated and a dam built at the lower end of the lake area. Recently an upper dam was constructed and a settling basin provided to keep the lake proper from filling up with the débris carried down by the stream. The lake has been named in honor of the donor, who has made many other gifts to the college.

AUTO TRUCK MADE INTO PORTABLE GROCERY

The term "vending de luxe" might be used to describe the grocery business which an Arkansas merchant has built up by employing an especially designed auto truck that daily carries a $750 grocery and meat stock on a five-mile route, stopping at about 100 houses. The body of this two-ton



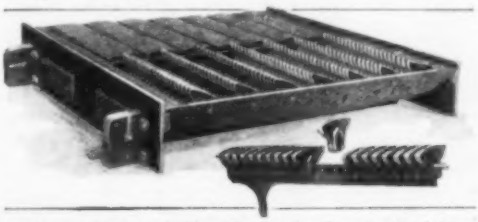
Students of Iowa State College Excavating for an Artificial Lake on the Campus: In the Foreground at the Left Is the Upper Dam; at the Right, a View of the Lower Dam

Two-Ton Truck, Loaded with a $750 Grocery Stock, Which Stops at About 100 Houses on a Five-Mile Route Each Day: The Electric Gong on the Front Warns the Housewives of the Itinerant Grocer's Approach

truck is 16 ft. long and 6 ft. wide. The interior is electrically lighted, and at the rear is a vestibule, with standing room for six persons, which contains a counter and an ice box. Drawers, shelving, and a candy case line the walls, and wire netting, or rods, hold the goods in place. The driver's compartment is shut off from the rest of the little store by a windowed partition. Most of the stock is done up in convenient packages ready for buyers, though scales are provided for use if needed. Underneath the body are two crates for live poultry, and tanks for kerosene and oil.

FIRE-BOX GRATE CAN BE REPAIRED DURING USE

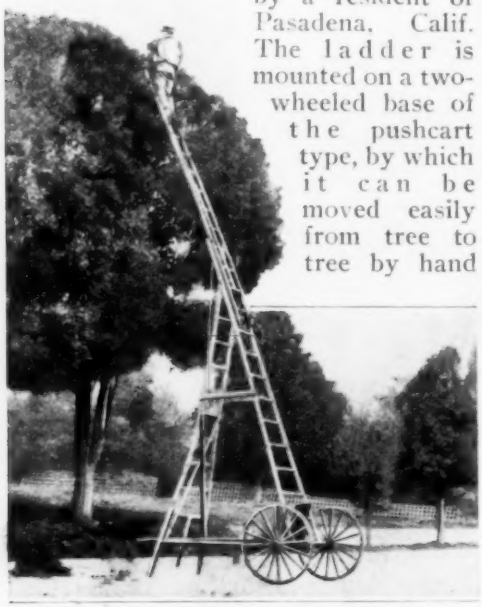
A grate now being introduced for use in stationary boilers and locomotives where hand dumping is practiced, is so built that if a portion of it burns out the burned parts can be replaced without drawing the fire, and at small cost. This fuel bed permits a large volume of air to pass through it and the tendency is to prevent the formation of clinkers. It is provided with crossbars that are rocked by side bars having double instead of single bearings, as a safeguard in case some of the bearings burn out. Fitted onto the crossbars are triangular units called fingers, on which the fuel rests. If one of these burns out, it can be easily removed with pincers and replaced by a new one, without drawing the fire or disturbing the rest of the grate. The upper edge of each finger is grooved to catch fine ashes and so form a coating which prevents clinkers becoming attached to the grate. The crossbars and fingers are so made that air circulates among the parts freely, tending to keep them cool.



Grate so Designed That It can be Repaired without Drawing the Fire. Below: One of the Crossbars, Showing the Manner in Which the Removable Fingers are Fitted in Place

EXTENSION-LADDER CART FOR TREE TRIMMING

Trimming large trees is made comparatively easy by a portable extension ladder constructed by a resident of Pasadena, Calif. The ladder is mounted on a two-wheeled base of the pushcart type, by which it can be moved easily from tree to tree by hand when extended, or can be towed behind an automobile for transportation to a distance. In the fully extended position the ladder is 30 ft. high. A tree trimmer can reach an additional 15 ft. from the top with his long snips, wearing a safety belt fastened to the ladder to leave both hands free for work.



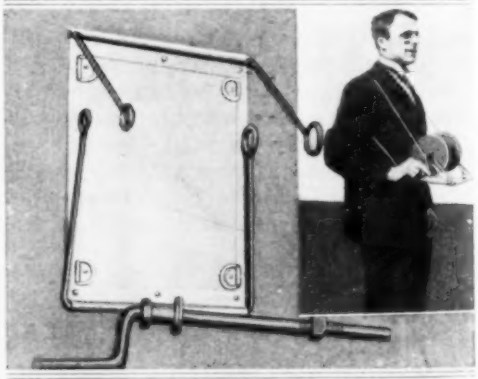
Trimming Trees with the Aid of an Extension Ladder, Wheeled About on Its Cart

ICE ON GREAT SALT LAKE CAUSES PERPLEXITY

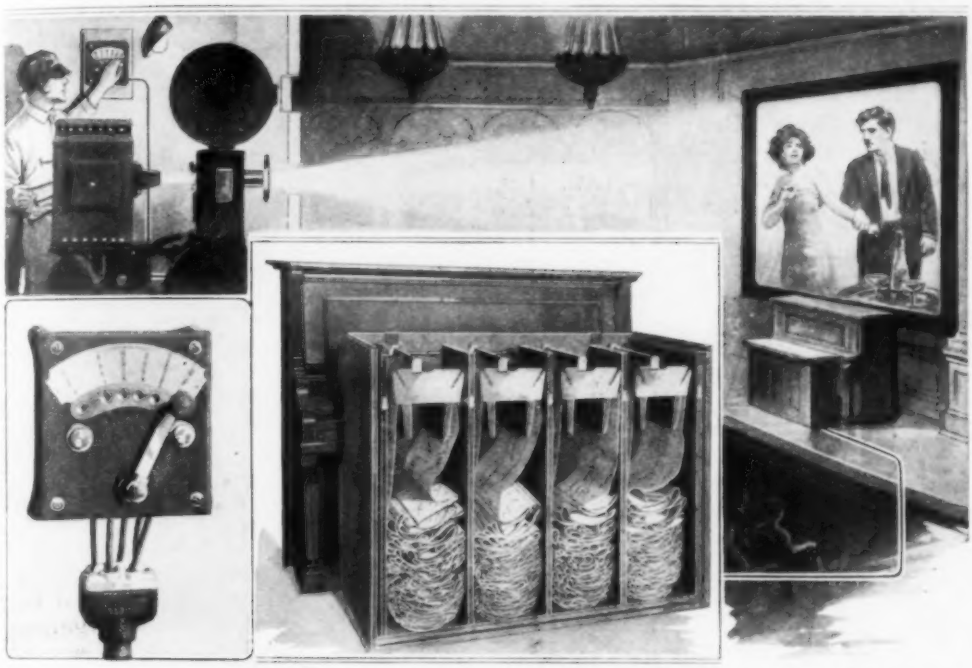
Much to the perplexity of many old residents of Utah, acres of ice capable of supporting a man's weight were discovered at one time last winter on Great Salt Lake in the vicinity of Saltair Beach pavilion, which is not far from the capital of the state. It is said that not since the coming of white settlers to this region has such extensive ice been known to remain on this body of salt water. Investigators made their way through the ice in a motorboat to the mouth of the Jordan River, about 20 miles from the pavilion. Here they found fragments of thick ice and much new thin ice in the wide-spreading estuary into which the river empties. It is believed that the stillness of the lake for several hours permitted the accumulation of considerable fresh water in the estuary, and that after this had frozen because of the very cold weather, a light wind dislodged the ice and it slowly drifted across to the vicinity of the pavilion.

FOLDING REEL DEVISED FOR FORESTRY SERVICE

A folding reel used by the Forest Service in stringing emergency telephone wires, which is the invention of an officer in the service, dispenses with the cumbersome reels formerly employed. Folded, it measures only about 6 by 10 inches. The base of the device is a galvanized-iron tray to which shoulder straps are attached to hold it horizontally in front of the worker. To mount a spool of wire on it a rod with a crank handle is inserted through the spool, the crank rod being mounted in the four braces that are hinged to the corners of the tray and hold it firmly in position.



Reel Partly Folded Up, Showing the Rod with Crank Handle and the Hinged Standards Attached to the Four Corners of the Tray. Insert Shows How the Reel is Supported in a Convenient Position in Front of the Wearer by Straps That Extend over the Shoulders



New Piano Player for the Movies, Which is Controlled Electrically by the Operator in His Booth: In the Center Is an Interior View of the Player; at the Left, the Control Switch

NEW ELECTRIC PLAYER FOR USE WITH MOVIES

An entirely electrical piano player, controlled from the operator's booth, is one of the latest adjuncts of motion-picture theaters. It was devised by a Columbus, Ohio, man to furnish instantaneous changes in the music played, to harmonize with the action of each picture shown on the screen. The player occupies an ornamental case, set before the piano, and has four compartments, each containing 10 or 12 complete musical compositions in the form of perforated rolls. In the first compartment are the very fast selections; next, music in moderate time; then, very slow music for pathetic scenes, and last, odd selections for special pictures. Each piano key is played by a mechanical finger, controlled by an electromagnet, the electrical contact being made through the holes of the music roll by metallic brushes normally held above the paper by springs. The music is controlled by the operator in his distant booth, by means of a switch and dial, which is set for fast, medium, slow, or special music as desired.

EFFICIENCY TROPHIES FOR KANSAS GUARDSMEN

A silver trophy is to be presented annually to the most efficient company of each of the two regiments of the Kansas National Guard. It will be awarded at the annual encampment. Each shield is about 16 inches high, mounted on a wood base, with a flag, a soldier standing at "port arms," and the seal of Kansas in gold relief, and an engraved camp scene in the background.

STATE FLAG FOR ILLINOIS CENTENNIAL YEAR

The State of Illinois was admitted to the Union in 1818 and fitting centennial celebrations are planned for next year by the centennial commission, which has adopted a distinctive state

Official Flag of the Illinois Centennial, to be Flown during the State-Wide Celebration Next Year

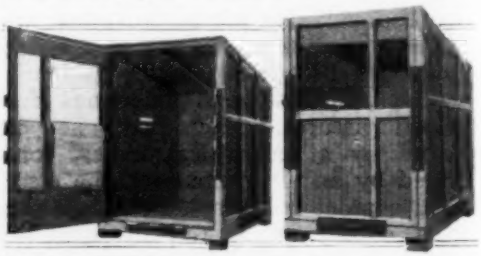
flag to be flown during the year below the stars and stripes on public buildings. It was designed by a Chicago poet, and shows a broad blue horizontal bar, typifying union, between two white ones, which symbolize peace and justice. Ten blue stars above and ten below the central bar represent the ten northern and ten southern states admitted before Illinois, which was the 21st state, and is represented by a large white star on the blue bar. This blue bar of union is symbolic of the work of Lincoln, the greatest of all Illinoisans.

GERMAN SUBSTITUTES FOR RUBBER TIRES

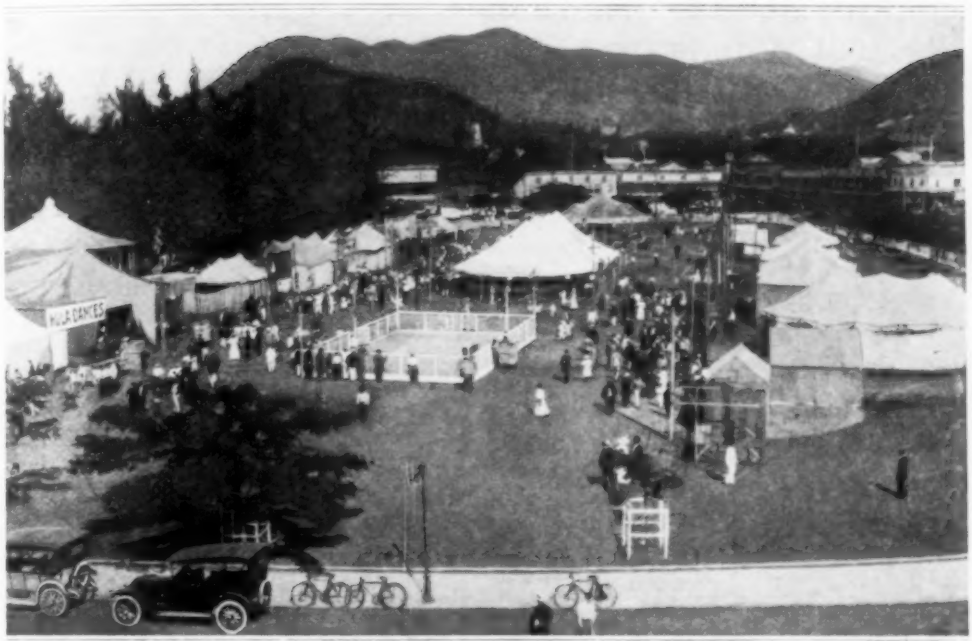
Rubber being scarce in Germany nowadays, a number of bicycle tires made of substitutes for rubber are reported to have appeared on the German market. First came a tire made of steel wire about $^3/_{16}$ in. thick, closely coiled, with ends welded together. This was high-priced, damaged pavements, and rattled in use. Then came three different types of wooden tires, the cheapest being made of a single piece of wood, while others are made of wooden sections. Another type of wood tire has the outer surface covered with a leather strip. Steel springs are used with all the wooden tires, either in the forks or between tire and rim, which adds considerably to their cost. Tires covered with leather or with canvas, instead of rubber, are also on the market. But the best substitute for the rubber tire has an outer tube of prepared canvas and a cloth-wound inner tube filled with a solid preparation resembling rubber, that is said to be quite elastic.

COLLAPSIBLE BOXES FOR SHIP FREIGHT

Strong wooden or metal structures of box shape, for the shipment of horses and cattle by sea, or general freight purposes, are made collapsible by a Scottish invention of recent date, and can be put together or taken down in a few minutes. The sides, top, and bottom form separate sections, which are combined by bolt hinges. When the removable rods are withdrawn from the hinges the sections can be packed flat in one-quarter of the space required for the assembled box. Thus the empty boxes can be returned to the place of shipment for further use, at very low charges for freight. Shipping cases for automobiles, pianos, and machinery can be made on this plan.



Padded Shipping Box for a Horse: The Box can be Taken Apart by Withdrawing Bolts from the Hinged Sides and Tops

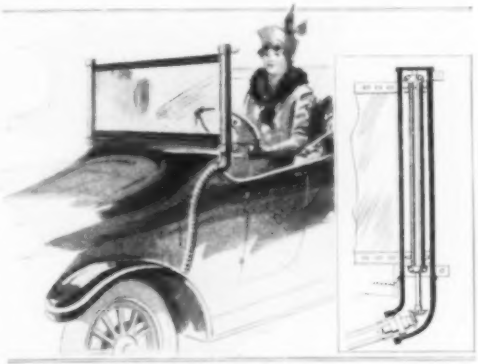


WINTER CARNIVAL HELD IN MID-PACIFIC

ONE of the features of the winter season in Honolulu was a carnival which, though held in mid-Pacific, had many of the elements of similar events in colder climes. At Aala Park, where the carnival was held, typical American circus stunts and sideshows entertained the natives, while many visitors found equal pleasure in watching the hula dances expertly performed within the carnival grounds, with their picturesque background of towering Hawaiian mountains.

DEVICE KEEPS WINDSHIELD CLEAR DESPITE RAIN

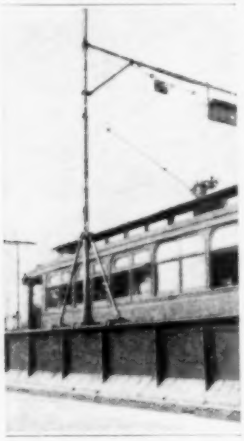
An attachment that assures the motorist a clear outlook through the windshield in spite of rain or snow, is the invention of a Chinese resident of Portland, Ore. An important part of the device is an endless sheet of transparent celluloid that fits around the windshield, covering it front and back, and passing about rollers at the right and left of the glass guard. Each roller is inclosed in a housing that is clamped to the windshield frame so that the attachment can be easily removed. One roller is connected by means of a flexible shaft and gearing with a sprocket wheel on the inner side of one front wheel. When the car is in motion the sprocket wheel turns the roller by means of the shafting, causing the celluloid sheet to travel round and round. Teeth near the ends of the rollers engage perforations at the edge of the sheet and prevent it from slipping. As the celluloid passes through the housings, a rubber or felt wiper brushes off the accumulated rain or snow, so that the driver always has a clean shield in front of him.



Attachment Which Keeps Windshield Clear: The Revolving Celluloid Band in Passing through the Housings at Either Side is Wiped Clean of Snow or Rain, Giving the Driver an Unobstructed View

CLAMPS SUPPORT TROLLEY POLES ON BRIDGE

Special clamps have been employed by a California electric railway to support trolley poles on the top of the girders of a bridge over which the line passes, thereby making it unnecessary to fasten the poles to the floor. These fastenings are of cast metal and are used in groups of three. The center one of each group is provided with a socket in which the pole is set, while iron braces are attached to the other two and give the pole support at opposite sides. The clamps make it possible to erect a pole at any point on a bridge with a minimum of labor and in a position where it takes up no roadway or walk space.



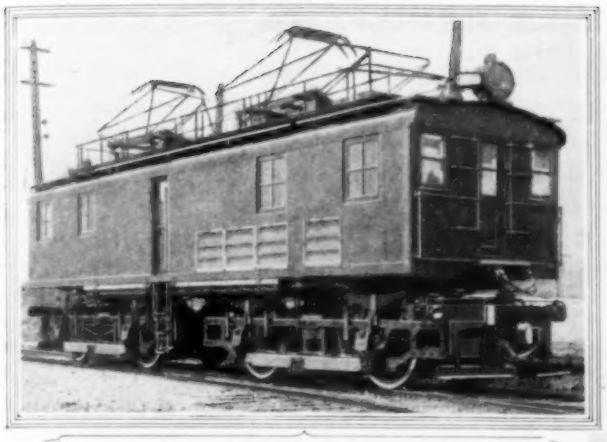
SHOTGUN HAS BARRELS SET ONE ABOVE THE OTHER

A prominent gun manufacturer in England has recently produced a double-barrel shotgun having one barrel above the other, instead of the two being side by side. This arrangement, it is claimed, offers considerable advantage in aiming, for the hunter is not confused by a barrel either side the line of aim. The breadth of the double barrel is reduced by more than one-half, thus permitting the game to be seen up to the moment of firing. The fore end of the stock is so fashioned that it fills the left hand and allows a firm grip to be obtained, while the arrangement of the barrels brings that hand well below the line of vision when aiming. The gun is equipped with a single trigger and a special lock which make possible a light pull-off, if desired. A system of compound levers in the lock gives 50 per cent more pressure than in the ordinary lock, on the parts which release the hammer, so that a light pull discharges the first barrel without any risk that the jar of the explosion may again release the hammer and set off the second, which danger is present in other double-barrel guns of the single-trigger type.

A Shotgun of English Make, Having One Barrel Placed above the Other for the Purpose of Giving an Advantage in Aiming. It is Equipped with a Special Lock Also

ELECTRIC LOCOMOTIVES SHIPPED IN BOXES

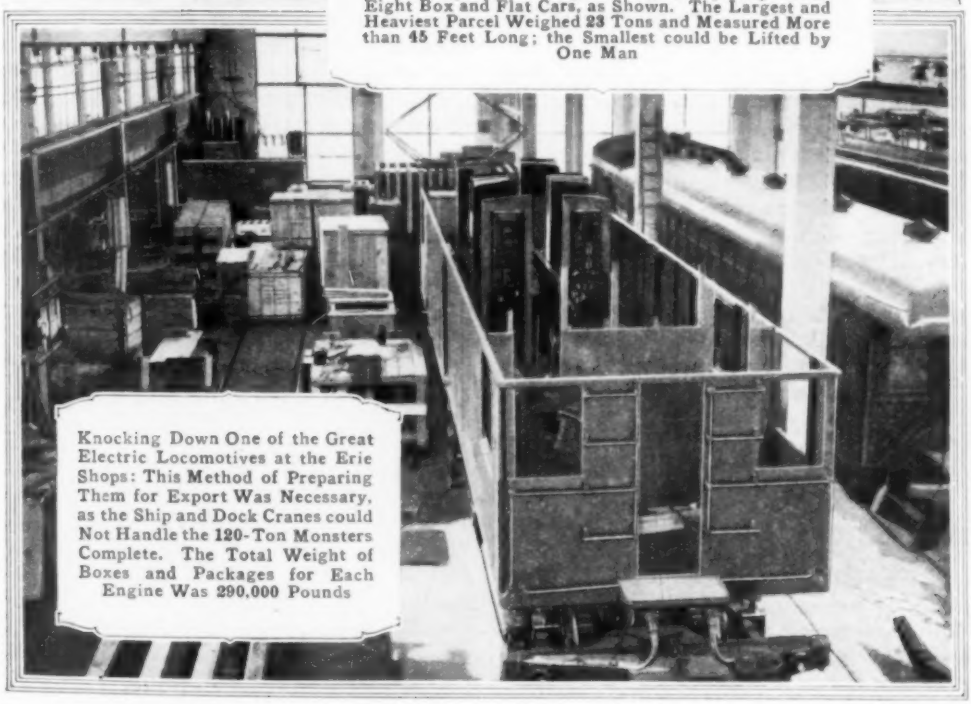
Three large electric locomotives, weighing 120 tons each, were shipped recently from Erie, Pa., to Chile, South America, in knock-down form, being boxed for convenience of shipment. They are intended for use in transporting iron ore from the mines of an American steel company at Tofo, Chile, 2,200 ft. above the sea level, to Cruz Grande, the nearest shipping port. For a while the problem of getting the engines to Chile baffled the traffic men, as they were too big and too heavy to be taken aboard ship intact. The only alternative was to take them apart for shipment. When this was done and the parts were boxed it was found that each of the locomotives occupied eight freight cars and weighed 290,000 lb. There were 62 separate boxes, ranging in size from over 50 ft. to only a few inches in length, the largest weighing more than a ton before being packed. Everything was boxed but the underframe, wheels, and axles of each car. Each part or section was carefully numbered as it was packed, and full directions for reassembling the locomotives accompanied the shipment, so that the engineers in the South American republic would have little difficulty in putting the parts together as before.



One of Three 120-Ton Electric Locomotives Recently "Knocked Down" at Erie, Pennsylvania, and Packed in Boxes for Export to Chile, Where They will be Used in Transporting Iron Ore from the Mines, 2,200 Feet above Sea Level, to the Shipping Port of Cruz Grande

Lowering the Underframe of One of the Electric Giants into the Hold of a Freighter in New York for the 40-Day Voyage to the Chilean Port

Each Locomotive When Taken Apart was Made Up into 62 Separate Packages Which Completely Filled Eight Box and Flat Cars, as Shown. The Largest and Heaviest Parcel Weighed 23 Tons and Measured More than 45 Feet Long; the Smallest could be Lifted by One Man



Knocking Down One of the Great Electric Locomotives at the Erie Shops: This Method of Preparing Them for Export Was Necessary, as the Ship and Dock Cranes could Not Handle the 120-Ton Monsters Complete. The Total Weight of Boxes and Packages for Each Engine Was 290,000 Pounds

PROSPECTORS USE A STOVE FOR VENTILATION

A novel method has been adopted by some ingenious prospectors in Montana for ventilating their prospect

Ventilating a Prospect Hole by Means of a Stove: The Shaft beneath the Windlass in This Photo Is 60 Feet Deep

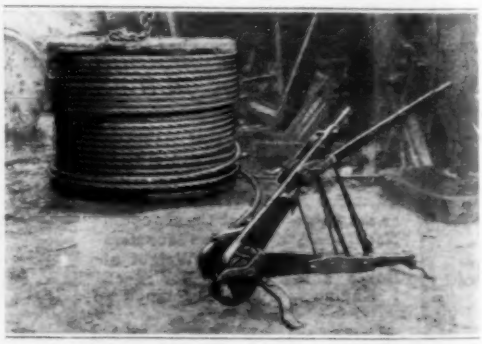
holes. When they have dug to such a depth that fresh air no longer circulates freely to the bottom of the hole, they set up an air-tight stove at the edge of the shaft, putting up three or four lengths of stovepipe for a chimney and running another pipe from the bottom of the hole to the air intake at the front of the stove. The latter pipe is held in place by fastening it to the shaft timbering. When a fire is built in the stove, air is drawn from the bottom of the shaft and fresh air circulates downward to replace it. Ventilation can be secured in this way to a considerable depth.

CLOGS COMING INTO USE IN LONDON

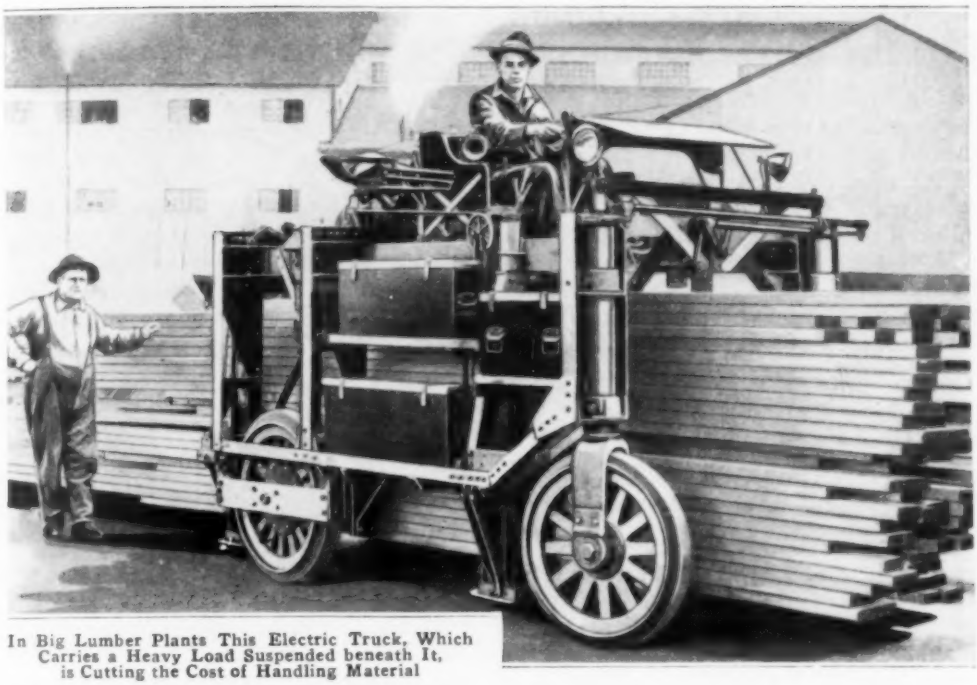
Clogs are coming into use in London on account of the shortage of sole leather. This form of footwear, which consists of a leather upper with a wooden sole, has long been worn by the textile workers in northern England, and now that leather is so scarce, the London County Council, through the school-teachers, are providing the poor children with clogs which cost about 73 cents per pair. These are paid for in weekly installments of six cents each. It is said that a really fine pair of clogs can be obtained for one-quarter the price of shoes, and it has been urged that business men wear them to work. Already the demand is so great for this economical form of footwear that one British manufacturer has declined an order from Belgium for 100,000 pairs of wooden shoes, because he is busy making clogs.

HANDY CUTTER FOR STEEL CABLES AND RODS

A portable machine for cutting heavy cables and iron and steel rods, invented in Portland, Ore., is built on the plan of a giant wire cutter. It operates by hand, the power of a hand lever being developed through a series of pulleys and ¼-in. steel cables to give a pressure of 90 tons on the cutting jaws. The machine is designed to cut 1½-in. cable and 1¼-in. rod, and is intended for use in the woods or by wreckers. Its action being positive and practically instantaneous, it is said to eliminate all danger of a cable flying when cut. Two sizes will be made, weighing 50 and 100 lb. respectively.



New Machine Ready to Cut the Cable Inserted between Its Powerful Jaws: Its Hand Power is Multiplied by Pulleys



In Big Lumber Plants This Electric Truck, Which Carries a Heavy Load Suspended beneath It, is Cutting the Cost of Handling Material

ELECTRIC LUMBER CARRIER CUTS HANDLING COST

Increasing use is being made of an electrically driven lumber truck that lessens the cost of handling material. In transporting lumber between mills, kilns, yards, and cars, it accomplishes the work of several men and a half dozen or more horses. The outstanding feature of the apparatus is that it carries its load suspended beneath the chassis and is arranged to pick up a pile containing as high as 3,000 board feet in approximately 10 seconds, without requiring the operator to leave his seat. Loads of different size and character are negotiated with equal facility, a 70-ft. timber being accommodated as readily as a railroad tie. Two sets of storage batteries, good for five hours' continuous use, supply the current. The machine will take short six-percent grades and normally travels at a speed of from 7 to 10 miles an hour. One of the trucks is credited with having handled 200,000 ft. of lumber in a day. Forks support the body of the vehicle high above the wheels and an equalizer automatically adjusts the load when some obstruction or a rut is encountered. Lumber is stacked on two blocks that raise it a couple of inches above the ground, and while the machine straddles it, hooked arms reach under the pile and lift it to the carrying position. That completes the loading operation. The material is released as simply.

CONVENIENT HOOK WITH LOOPED HANDLE

The ordinary latch hook, whether it be for a cupboard, barn door, chest, or the like, frequently causes much annoyance because it is inclined to stick and is difficult to grasp.

A recently patented hook provides against such inconvenience by means of a looped handle projecting from its shank, which makes the catch easy to operate. The cost of manufacture is low, for a single strip of wire can be twisted by machinery to form the loop and the hook.

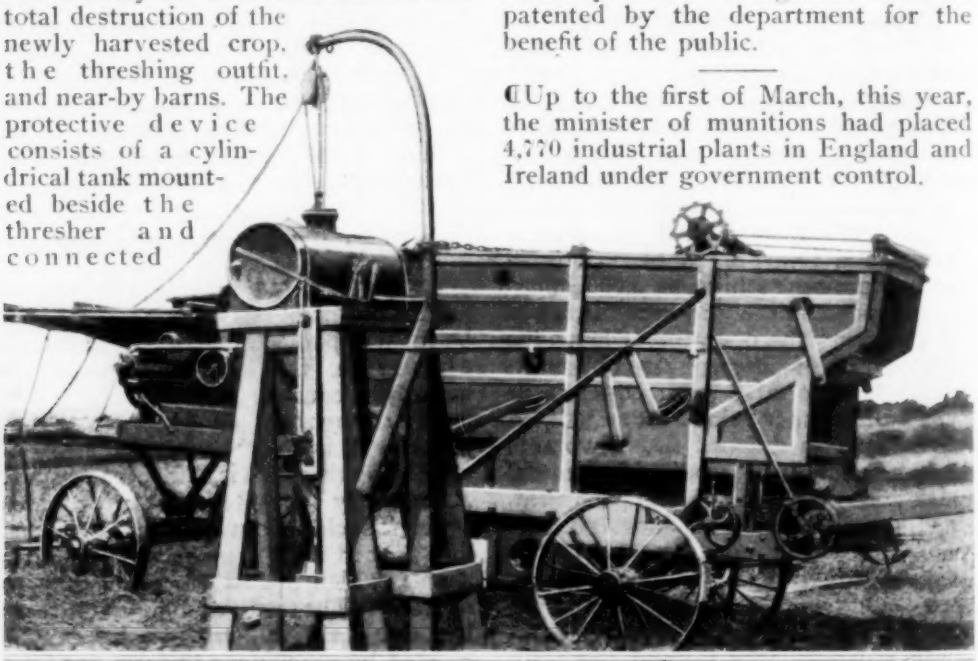
MOVIES DEPICT WHALING SCENES DRAMATICALLY

One of the most dramatic sets of educational films that have been produced showing various industries of this country is that illustrating the life of American whalers which was exhibited not long ago in Boston. These views take the spectators aboard a vessel, captained by a veteran whaler, which goes out into the stormy Atlantic in search of its prey. At times the big waves roll over the decks of the ship, setting everything awash, and the onlooker feels that the very room in which he is sitting is rocking to and fro. At length a spouting whale is sighted in the distance. A little later the audience witnesses the fight with the whale and his capture. The body is dragged to the vessel and cut into pieces, while during part of the performance a school of sharks, attracted by the prospect of much good food, swim near by.

FIRE EXTINGUISHER FOR THRESHING MACHINES

A bureau of the Department of Agriculture has recently developed a fire extinguisher to be attached to threshing machines for the purpose of automatically putting out any fire caused by an explosion in the latter. Explosions are often produced by the ignition of dust from smutty grain which permeates the chambers of the thresher and in many cases have resulted in the total destruction of the newly harvested crop, the threshing outfit, and near-by barns. The protective device consists of a cylindrical tank mounted beside the thresher and connected with it by pipes. The tank is filled with water containing certain chemicals in solution and also a sealed flask of acid. It is so connected with the machine that an explosion releases a hammer in the tank which breaks the flask. The resulting mingling of the two liquids instantly creates a gas, while the pressure produced by the gas forces the fluid through the pipes, so that the threshing machine is thoroughly sprayed before the fire gains headway. The extinguisher will be patented by the department for the benefit of the public.

¶Up to the first of March, this year, the minister of munitions had placed 4,770 industrial plants in England and Ireland under government control.



Mounted beside This Threshing Machine Is One of the Government's New Fire Extinguishers, Which Automatically Put Out Any Blaze Caused by a Dust Explosion

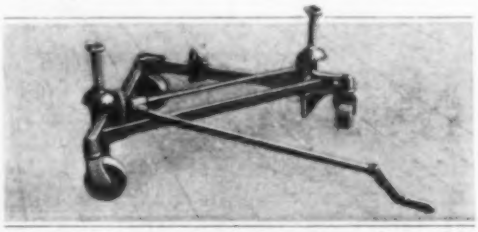
New Electric Heaters in Use in the Chemical Laboratory of an Idaho High School: Each Apparatus is Used by Two Students, with Current from the Light Circuit. Insert Shows the Heater Details

NOVEL ELECTRIC HEATER FOR LABORATORY USE

An electric heater to take the place of a Bunsen burner was invented recently by an instructor in a new technical high school at Rupert, Ida., and is now used in the science laboratories in all experiments that require heat. Being of convenient conical form, the heater supports the article to be heated, without the aid of a tripod. It is attached to the ordinary light circuit of 110 volts and uses from 275 to 550 watts, according to the amount of heat required for the experiment in hand. Practically all forms of glass and porcelain vessels used in the electric and chemical laboratories can be heated, including test tubes, beakers, flasks, evaporating dishes, crucibles, or sand and water baths. There are simple and inexpensive attachments for these various purposes, while a water heater and steamer attachment is provided for experiments in physics. Each heater serves two students.

TWIN AUTO JACK MOUNTED ON WHEELS

An improved automobile jack for garage use is of the twin type, both of the front or the rear wheels of a car being raised simultaneously by turning the handle of a crank geared to two upright posts on which the axle rests. The whole device is mounted on a triangular steel frame, with a caster wheel at each angle, so that when the twin jack is in use and the wheels of

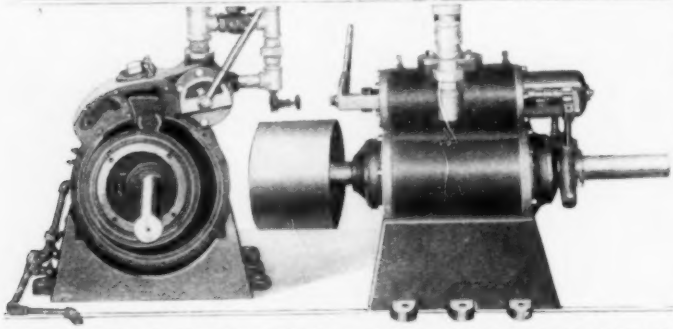


Twin Automobile Jack Which Raises Two Wheels at Once by Simply Turning the Crank

an auto are raised by it, the car can be freely moved about without releasing the jacks.

NEW-TYPE ROTARY ENGINE FOR STEAM OR GAS

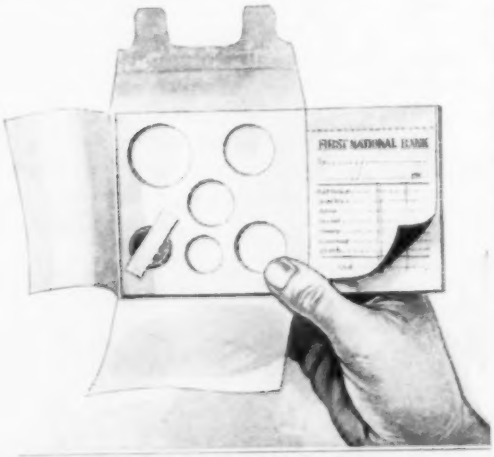
An engine which delivers the power of an expanding force, either steam or gas, directly to a rotating shaft, without crank or flywheel, has been devised by a Kentucky inventor, who claims that it combines the desirable features of both reciprocating and rotating engines. While the head pressure of expanding steam or gas is retained, as in the reciprocating type, a greater rotating effect is secured from side pressure within the cylinder, exerted by a wedge of expanding fuel on the face of the rotor, and directly turning the shaft which passes through the cylinder. By the construction and operation of the engine a wedge-shaped cavity is opened or created for the reception of the fuel charge. This cavity is formed between the pivoted rotor and the cylinder walls, the expanding charge being driven point first around the cylinder from inlet to exhaust, forcing the rotor to turn with it.



Rotary Engine of a New Type, Having a Reciprocating Feature and Adapted for Either Steam or Gas: Full-Face View at the Right, End View at the Left with Cylinder Head Removed

SAVINGS DEPOSITS EASILY MAILED IN NEW COIN CARD

Depositors of small sums, especially children, frequently find it inconvenient to build up a savings account by mail because they have no satisfactory means of sending their coins to the bank, but this difficulty seems to have been overcome by the invention of a coin card of which a Brookings, S. D., banker is the originator. In one end of the card are recesses for coins of five sizes, that can be held in place by three gummed flaps. Between these flaps paper money or checks can be placed, if desired. Attached to the other half of the card is a small deposit slip, carbonized on its under side, on which the depositor enters his amounts, making a duplicate of his entries on the card. The slip is retained, while the card and money are sent in a sealed envelope to the bank.



Coin Card, with Deposit Slip Attached, with Which Small Savings Deposits can be Mailed Conveniently: The Bank Using These Cards Starts the Prospective Patron with One Cent Inserted in One Recess

OFFICE ON WHEELS FOR MILITARY USE

An automobile truck, fitted up as a headquarters office for use on the march or in the field, was designed recently for the staff of the New York National Guard. It is mounted on a 1½-ton chassis and while light enough to travel rapidly when required, will

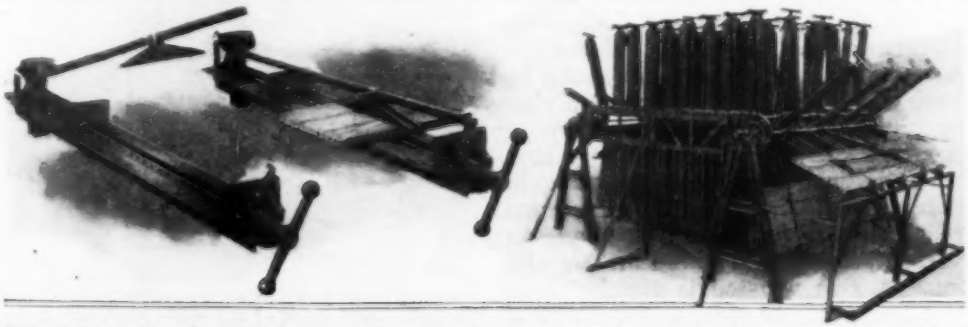
A National-Guard Headquarters on Wheels: This Motor Truck was Designed for the Use of Staff Officers of New York Troops Serving on the Mexican Border, and Makes a Wonderfully Compact Office. Interior View at the Left

also stand the rough usage of active service. It furnishes office accommodation for eight persons at a time, there being seats for six along the sides, facing a large table in the center of the car, on which maps can be spread out and examined. At one end is a built-in desk with seats for two and plenty of filing cabinets for correspondence, reports, orders, and maps. A telephone is provided for connection when the office car is halted, and electric lights in the roof furnish illumination for night work. Outside the car is a long shelf folding flat to the side, used when open as a desk for writing reports without entering the car. Side and rear curtains are provided for protection against the weather.

¶Fifteen thousand incinerations are made annually at the 62 crematories now operated in North America.

CLAMP CARRIER SAVES CABINETMAKER'S TIME

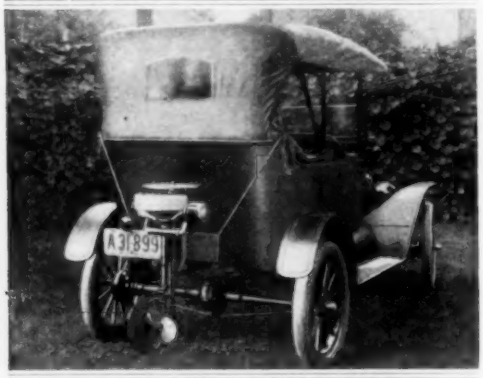
The advantages claimed for a clamp carrier, designed for cabinetmakers, etc., are that it saves valuable shop space and also the user's time. The essential feature of the apparatus is an endless conveyor about six or seven feet wide provided at intervals of a few inches with transverse rods. The conveyor moves easily in angle-steel runways supported about five feet from the floor by a steel framework. The adjustable steel clamps, of which there are 160 in the model shown, are attached in groups of four to the transverse rods. A movable support is provided to hold the outer ends of the four clamps that happen to be projecting horizontally at the end of the rack, so that the workman can fill them with the parts to be glued together.



Carrier Equipped with 160 Steel Clamps in Which Freshly Glued Woodwork is Fastened: Arranged as Shown Here the Clamps Occupy a Minimum of Space and Are Always Ready for Use

ROWBOAT MOTOR CARRIED AT REAR OF A CAR

A motorist in New York state found a way to carry a rowboat motor on



How a New York State Motorist Carried His Rowboat Motor to a Lake: The Rack Also Serves to Carry Baggage

trips to a lake, without taking up any of the passenger space, by bracing a rack with a vertical board at the rear of his car. The portable motor was then hung over the board as at the stern of a boat, leaving about 10-in. clearance with the rudder slipped off. Thus the motor traveled right side up in safety, and it was unnecessary to drain the gas tank.

GERMANY LIMITS WARDROBES OF ALL SUBJECTS

Probably the most significant of Germany's many conservation measures is the radical ruling now in effect which definitely prescribes what articles of clothing and how many of them a man or woman may possess. An imperial clothing bureau has been established, and before any subject can purchase apparel, a permit must be obtained. This is done by supplying the authorities with an inventory of garments on hand and showing that the individual wardrobe is lacking in attire officially allowed. Boys and men are permitted to have two suits, an overcoat, a pair of working jackets and trousers, two waistcoats and business shirts, one pair of gloves, four pairs of hose, a half dozen handkerchiefs, three suits of underwear, two night robes, three pairs of shoes, and one pair of slippers. Women are allowed three dresses, a skirt, two blouses, a coat, one shawl, a wrapper, four suits of underwear and the same number of pairs of hose, a pair of gloves, three pairs of shoes, four house skirts, a half dozen handkerchiefs, and three night dresses. Such things as bedding and towels are also limited.

NEW BALLOT BOX PROTECTS AGAINST FRAUD

A new type of ballot box has been patented which guards against election frauds by stamping each ballot as it is deposited, by counting the votes, and by remaining closed except when operated by a special key. Many election irregularities are due to stealing or altering the ballots or to willful neglect in the matter of properly initialing them. This box is provided with a small crank that is connected with the stamping and recording apparatus. It is so made that when the locking device is released, the turning of the crank admits the ballot to the container, records the vote by adding one to the number in the open-face register, and stamps the sheets with any desired legend in such a way that two ballots cannot be cast at once and both be marked properly.

Patented Ballot Box Which Counts the Ballots, Stamps Each One, and Remains Closed Except When Operated by the Official to Whom is Intrusted a Special Key for Releasing the Mechanism

Sugar Mill in Mexico, Showing the Primitive Method of Extracting the Juice from the Sugar Cane: It is Operated by Mule Power and the Cane to be Crushed is Thrown into the Central Inclosed Area, Where It is Crushed by the Big Stone

PRIMITIVE SUGAR MILL IN MEXICO

Primitive simplicity characterizes the Mexican sugar mill shown in the accompanying illustration. Under the central portion of the rough shelter a concrete floor has been laid and surrounded with a low circular wall within which the natives deposit the sugar cane cut into short lengths. Within this area, also, is the big grinding stone, 7 ft. in diameter, 18 in. thick, and weighing a ton. Extending through the stone is a heavy beam, at one end of which is a wheel. To this end a mule is hitched and driven around the inclosed area while the stone crushes out the juice, which runs along grooves in the cement into troughs.

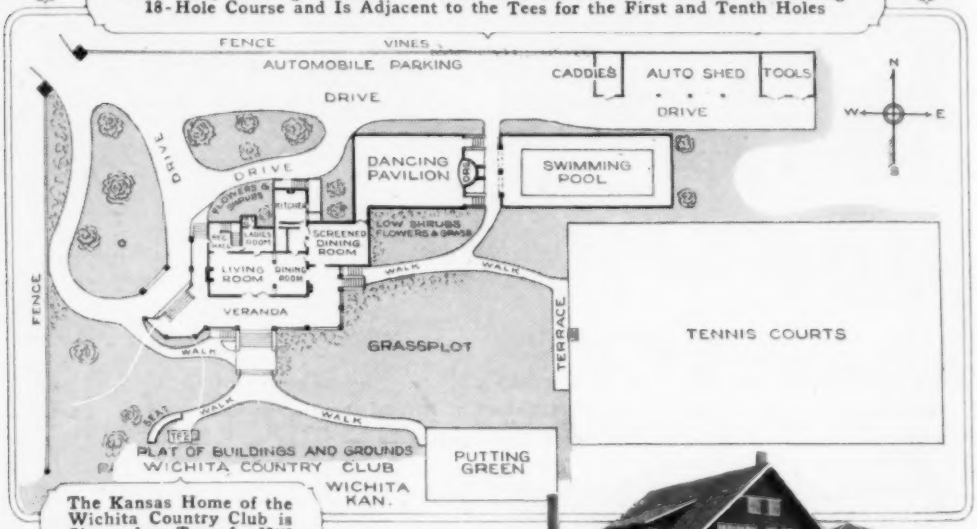
¶An under-water coaling station, with capacity for 100,000 tons, is being constructed in the Ohio River near Pittsburgh.

WARNING LAMP ON STREET-LIGHT STANDARD

An electric-light standard in the center of a busy street in Minneapolis has a small red light mounted near its base to indicate to motorists approaching in the dark that it is a substantial support for the lights above, and that the latter are not merely a hanging cluster beneath which they can drive in safety. The overhead lamps include four white lights mounted on arms at right angles to each other, surmounted by a large red light indicating that automobiles must keep to the right in passing.

AMERICA'S ATTRACTIVE COUNTRY CLUBHOUSES

Imposing Quarters of the Shaker Heights Country Club, Where Many Cleveland Players Hold Forth: The Broad Low Structure, Which Is the Largest Clubhouse in the Vicinity, is Constructed of Rough Gray Brick and Has Abundant Room and Wide, Inviting Verandas. It Affords a View of Much of the Undulating 18-Hole Course and Is Adjacent to the Tees for the First and Tenth Holes

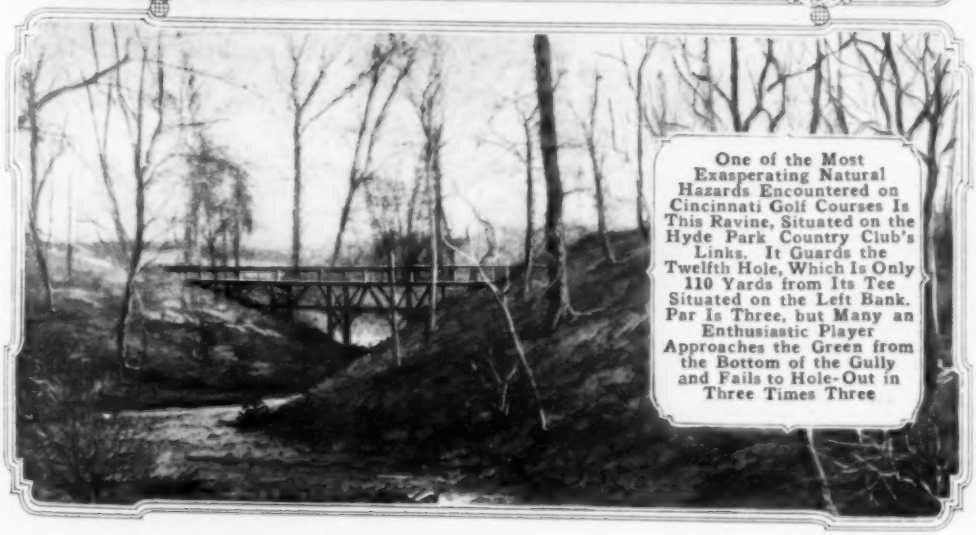


The Kansas Home of the Wichita Country Club is Situated on Top of a Hill Overlooking the City. As is Indicated by the Plat Above, the Grounds are Artistically Landscaped. Splendid Tennis Courts, a Large Bathing Pool, and a Roomy Dancing Pavilion Connected with a Screened Dining Room, Are at the Disposal of Members. The Clubhouse, Which is Pictured at the Right, Is New and Pleasing, While the 18-Hole Golf Course Adjoining Is Well Planned

Three Hundred of Cincinnati's Golf Devotees Support the Western Hills Country Club. As is Disclosed by the Picture Above, the Clubhouse Has a Pronouncedly Homelike Appearance and on Two Sides Offers Broad, Restful Verandas for Foot-Tired Players on Warm Summer Afternoons. It Has 10 Bedchambers and a Number of Outside Sleeping Porches for Its Guests

AND SOME OF ITS BEST-KNOWN GOLF COURSES

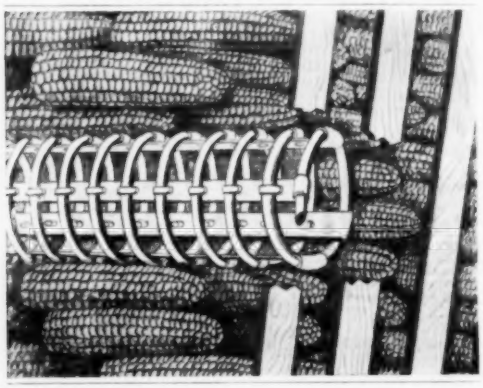
The Restful Seat of the Mayfield Country Club at Cleveland and Two Interesting Spots on Its 18-Hole Golf Course are Shown in the Accompanying Illustrations. The Club Building, Which is Constructed of Limestone and Cement, is Attractively Situated at the Edge of a Slope That Overlooks Part of the Links. The Fifth Hole, Viewed from Near the Tee, is Pictured at the Right, and the Thirteenth is Shown Below. Both Keep Players Awake and Call for Careful Strokes



One of the Most Exasperating Natural Hazards Encountered on Cincinnati Golf Courses Is This Ravine, Situated on the Hyde Park Country Club's Links. It Guards the Twelfth Hole, Which Is Only 110 Yards from Its Tee Situated on the Left Bank. Par Is Three, but Many an Enthusiastic Player Approaches the Green from the Bottom of the Gully and Fails to Hole-Out in Three Times Three

DEVICE FOR VENTILATING CORN IN THE CRIB

With a view to avoiding the loss caused by ear corn becoming heated



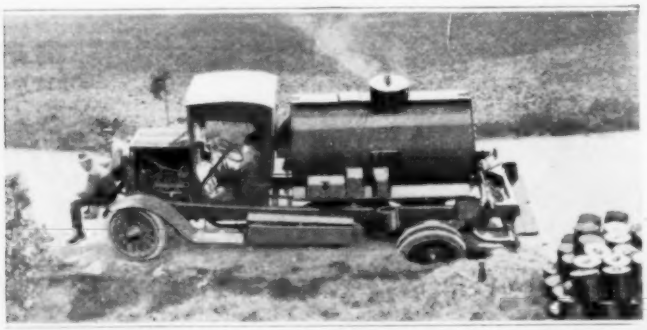
Rigid Coils of Wire, Made in the Form of Tiles, Which are Laid through Piles of Corn or Hay to Allow Circulation of Air and Prevent Overheating

in the crib, or hay becoming heated in the mow, a firm in Sioux City, Iowa, has invented what is called a wire tile, which can be laid in the midst of the corn or hay, with both ends exposed to the air, and so enable air to circulate freely through the crop. This device for preventing damage to harvested produce is made simply of coils of wire, 7 in. in diameter and 2 ft. long. Each coil is made rigid with metal stays that extend through it lengthwise and hold the ribs of the tile 1¼ in. apart. One good way to use these tiles is to lay them horizontally through a crib full of corn and to cross this ventilator with another set of tiles strung on a wire and hung perpendicularly. Though one unit weighs but 3 lb. it is capable of sustaining a weight of 750 lb., and, since it is so durable, can be used for many years.

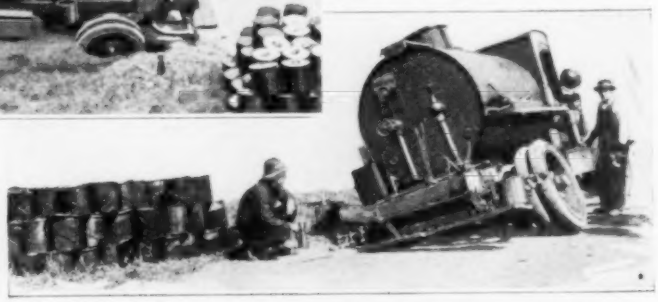
¶ Investigation carried on in Iceland last year revealed the presence of vast coal fields, which a recently organized Danish-Icelandic company now proposes to develop on a large scale, if conditions warrant.

ROAD-REPAIR TRUCK BREAKS THROUGH A PAVEMENT

An unusual accident occurred recently near Inglewood, Calif., when a 12-ton motor truck, loaded with oil, broke through the pavement on the Los Angeles-Redondo road. One of the rear wheels sank into the hole, the rear axle was sprung, and the entire chassis was twisted out of line. The truck was one owned by Los Angeles County and used in road-repair work. It was backing up to the edge of the road when the wheel crashed through. To get it out, it was necessary to unload the oil in buckets, then dig around the sunken wheel, build scaffolding in the hole, and lift the truck with jacks. The accident cost several hundred dollars.



Twelve-Ton Oil-Laden Truck with Wheel Sunk through a Paved California Roadway



The Load of Oil Had to be Transferred to the Buckets Shown Before the Truck could be Moved

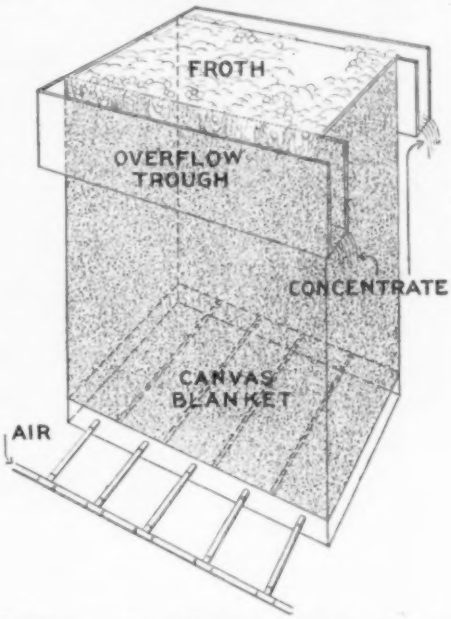
FLOTATION PROCESS GAINS WIDESPREAD FAVOR

By far the most radical development that has occurred in the field of metallurgy of late years has been the recent widespread adoption of the flotation process of mineral concentration. This system, which recognized authorities contend is still in an embryonic stage, is considered from a technical viewpoint to mark the beginning of another epoch in the milling industry. Strictly speaking, the method is not altogether a new one, but during the last few years the obstacles that previously interfered with its commercial use have been removed, with the result that there are now 200 or more plants in the United States employing it.

Flotation is a means by which certain minerals in finely ground ore are made to separate themselves from the gangue, consisting of quartz, feldspar, and similar materials, by rising to the top of water in which specific oils are present. Film and froth-flotation methods are distinct. By the former process the mineral particles float on the liquid's surface film. In the other case they are carried to the top by artificially generated air or gas bubbles which form a froth that overflows into troughs.

At the outset the ore is ground with water and a small amount of oil. There are several kinds of oil suited for the work. Not more than two pounds of oil to a ton of ore is used, and at many plants a much smaller proportion is favored. A volume of water about four times as heavy as the ore is introduced and the mixture turned into wooden tanks, which are known as flotation cells. Air is then either beaten into the water with powerful paddles, or it is blown through a thickness of canvas forming the bottom of the container. The particles of mineral, practically free from gangue, are held in the froth that forms in great quantities. The concentrate obtained from the foam is ready for the smelter.

The physics involved is interesting, although in some points obscure and debated. Essentially, however, what happens, is that the oil causes a selective action which permits the air bubbles to attach themselves to the particles of mineral, but not to the gangue. Specific gravity does not influence the process, for that of the mineral which is floated is higher than that of the material remaining at the bottom. The efficiency of mineral flotation is of course the important phase of the process. It offers so much greater percentage of recovery than has been obtained in the past by other methods that many old dumps can now be reworked profitably. Within the last year or so equipment for the flotation process has been installed at the reduction works of one of Nevada's most famous copper mines. An extraction of 78 per cent had formerly been obtained, but it is understood that the improvements have raised this ratio to 91, or a little more.



The Diagram Shows How Air is Forced through the Canvas Bottom of the Flotation Cell, Causing Bubbles to Form. The Latter Carry the Valuable Mineral Particles to the Surface, Where the Foam Overflows into Troughs

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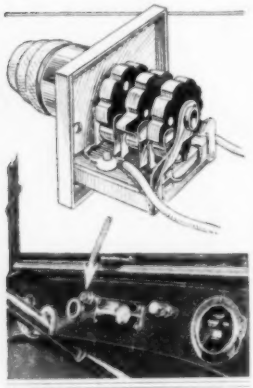
¶"No more oatmeal for dogs" is the edict that has gone forth in England, and now blooded hounds must accept simpler fare.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

INTENDED FOR THE HOME AND ITS MEMBERS

KEYLESS AUTO LOCK WORKS LIKE SAFE COMBINATION

A new ignition lock for automobiles has the advantage of being compact and keyless. It is installed on the instrument board in place of the key-operated lock, and the visible portion consists simply of three small knurled metal disks, each of which revolves independently and controls a corresponding hard-rubber disk on the opposite side of the board. Penetrating through each rubber disk, near its edge, is a small brass inset. The person that knows the combination turns the knurled rings until these brass insets are all in line and touch the brass contacts that form a part of the car's ignition circuit. Only by properly setting the lock can the circuit be closed. The one way a thief can "beat" the lock is to wire around it, which of course is something that would rarely be attempted.

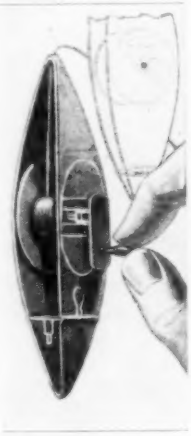


SPHERICAL BLACKBOARD AIDS IN MAP DRAWING

A spherical blackboard, for which a patent has recently been issued, is a schoolroom device that can be of great service in teaching pupils to draw accurately such geographic divisions as continents and hemispheres. Hinged to the base supporting this globe is a curved telescoping arm, at the end of which is attached a piece of chalk. This arm serves as a guide in drawing neat longitudinal lines, while by holding the chalk stationary at any desired point and revolving the globe, zone lines and parallels of latitude may be drawn with accuracy. The outer surface of the globe consists of a shell divided into two hemispheres, which can be removed and preserved, together with the maps on them, or the maps may be erased and the shell used again and again, if so desired.

TATTING SHUTTLE'S BOBBIN WINDS LIKE A REEL

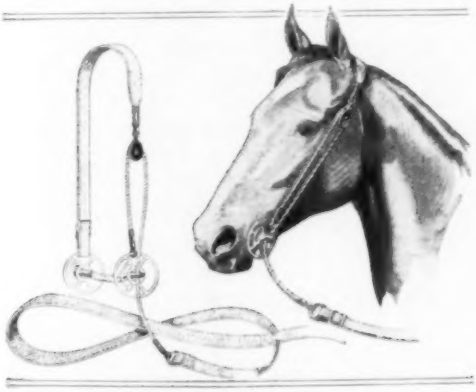
A new tatting shuttle has several novel features. The frame is made of resilient metal and holds a bobbin which is turned by means of a small crank when thread is to be wound on it. Near one end on the inside of the frame is a channeled guideway which receives the crank when it is not in use. Since it is somewhat wider than the normal space between the shuttle's two leaves, the crank tends to spread the latter apart slightly, so that the bobbin is allowed to rotate freely. Instead of the ends of the frame being held together by spring action they are entirely closed. At one end, however, there is a small hole through which the thread passes from the spool. This arrangement makes it unnecessary to turn the shuttle continually in order to unwind the thread.



¶For the purpose of calling attention to a special section in certain of its issues, a prominent trade journal marks the position of this department with a thumb index, which is made visible in the usual way, that is, by cutting away a portion of the leaves in front of it, as is done on thumb-indexed books.

BREAKING BRIDLE GOVERNS BY NERVE PRESSURE

A new breaking bridle is so designed that it gives remarkable control over an unmanageable horse, because pressure can be exerted on certain of the animal's spinal-cord nerves. This simple head harness has a rope bit which will not injure the horse's mouth, no matter how tender it may be. At each end is a large circular guard. A strap attached to the bit extends up the right side of the head and then just back of the ears, and terminates in a pulley on the left side. Fastened to the end of the bit at the left side is a small rope which passes upward through the pulley and then back through a metal loop projecting from the end of the mouthpiece. An extension of this rope serves as the leading rein. A pull on this rein causes the strap behind the ears to press down on a spot in the spine which is so sensitive that the horse is soon brought into subjection.



New Breaking Bridle Which will Not Injure a Horse's Mouth but Affords the Trainer Complete Control of the Animal by Exerting Pressure on Nerve Centers

HOLLOW GAS-STOVE GRATES REPLACE HOT-WATER COIL

Marked reduction in the cost of heating water by gas is made possible by a Minneapolis invention which utilizes the heat that commonly goes to waste around and above the gas burners of a kitchen range. The improvement consists of a set of hollow grates that take the place of those ordinarily used. They are connected by water pipes with a hot-water tank.

Heat Ordinarily Wasted around Every Burner is Utilized to Warm Water in These Hollow Grates, Which are Connected with a Hot-Water Tank

Whenever the burners are lighted for cooking, the water in them becomes heated and rises into the tank, without the consumption of any additional gas. When the stove is used but little for cooking, water may be warmed by placing metal plates over the grates and lighting the burners. The makers claim that four of these burners will warm water more rapidly than a copper-coil tank heater consuming the same amount of gas. These grates are also made for gasoline and oil stoves.

METAL SLINGSHOT CROTCH HOLDS ELASTICS FAST

A metal slingshot crotch has been patented, which is not only more accurately shaped than the kind that boys cut from forking branches, but also provides a special means for holding the ends of the elastics. Each branch of this crotch is made of two identical parts, between which the rubbers are inserted and held securely by turning a screw which draws the halves of the branch close together. This means of fastening the elastics is less apt to tear them than the old method in which strings were used.

DENTIST'S CASE CARD CAN BE ADDED TO AS DESIRED

The feature of a dentist's case card, which has been patented, is that a ruled extension can be conveniently attached to it when the space for memoranda on the original has been filled. This card resembles the ones commonly used by dentists in keeping track of each patient's dental work, in that it bears a diagram of all the teeth, so that the exact location of every filling, crown, etc., can be noted. When all the ruled lines on this card have been filled it is not necessary to make out a new one and copy all the notations made on the diagram. Instead an extension slip with a gummed edge is pasted to it. Cut in the original card are two semicircular slits which form lips that can be used to hold the folded extension so that it will not interfere with the handling of other cards in the file.

Extensible Case Card for Dentists: The Original Card Is About the Size of a Postal, and When Full, an Extension can be Attached as Shown in Insert

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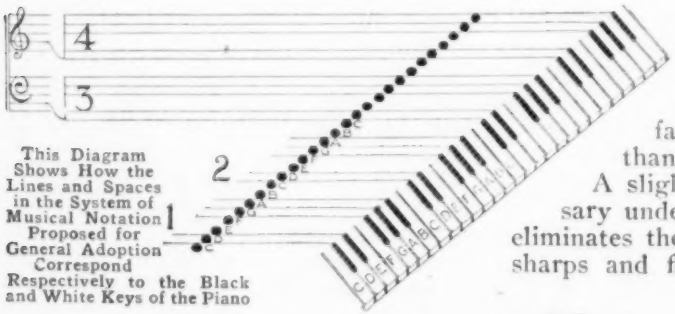
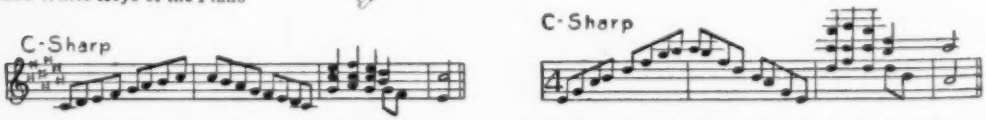
¶The New Haven Railroad has been asked by one of the towns through which it passes to lay a drain beneath its tracks at certain crossings so that, in case of near-by fires, hose can be laid in the culvert across the right of way and rail traffic will not be interrupted.

NEW SYSTEM OF NOTATION FOR WRITING MUSIC

In a new system of musical notation, suggested by a Kansas City man for general adoption, the staff used is so arranged that its lines represent the black keys on the piano keyboard, and its spaces represent the white keys. Instead of being equidistant from each other, as at present, the lines of the new staff are grouped in twos and threes, like the black keys, and it is claimed that music written on this staff is far easier to learn and read than the old style of notation. A slightly wider staff is necessary under the new system, but it eliminates the use of all the signs for sharps and flats, which often puzzle



This Diagram Shows How the Lines and Spaces in the System of Musical Notation Proposed for General Adoption Correspond Respectively to the Black and White Keys of the Piano



Here the Old and New Systems of Writing Music are Set Side by Side for Comparison. All Notes Played with Black Keys Are on the Lines in the New Notation

and confuse young students of music. Three lines above and two below a double space constitute the new fundamental five-line staff, others being added above and below, similarly spaced in groups, for writing the higher and lower notes.

REVOLVING DOOR COLLAPSES IN CASE OF PANIC

A recent improvement in revolving doors is intended to lessen the danger of their being blocked in case of panic. The new construction provides for the outward collapse of the rotating wings of the door whenever unusual pressure is exerted upon them, as by the efforts of an excited crowd to leave a building. There are as usual four wings, these being extended at right angles to each other when in the normal operating position. Each wing is fastened independently on a central vertical shaft by means of drum and gear castings which

Diagram of Improved Revolving Doors, Showing How They Collapse Outward under Pressure

act as hinges. A cable brace holds each wing in the extended position, and when the pressure on the wing becomes greater than is required to rotate it, one end of this cable slips, releases its hold, and the wing collapses toward the exit.

REAR SEARCHLIGHT TURNED ON BY REVERSE SHIFT

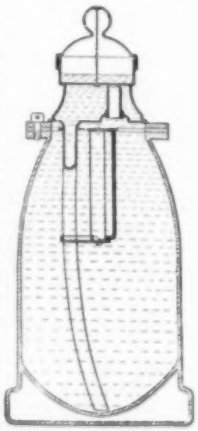
A strong white light may be turned on automatically at the rear of an automobile whenever the gear-shifting lever is put into reverse position, by means of a newly patented device, invented by an Oregon man. This furnishes convenient light for backing out of a garage, turning around on dark or narrow roads, or parking at night, and tends to secure safety in reversing.

Backing a Car with the Aid of a Rear Searchlight Device, Operated Automatically by the Gear Shift in Reverse

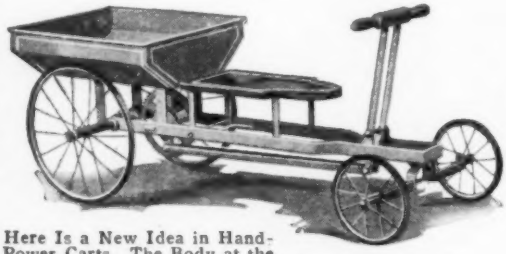
As it is connected with the lighting system the device operates only at night, or when the tail lamp is lighted.

NEW FORM OF BOTTLE FOR RADIOACTIVE FLUIDS

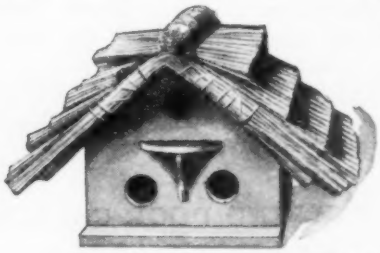
A Swedish inventor has lately patented a new form of bottle for the safekeeping of radioactive fluids, which are apt to lose their properties in ordinary containers, through the escape of gases. The bottle has a fluid-inlet tube, reaching nearly to the bottom, and an air-outlet tube above which is a ledge in the neck of the bottle on which a loose-fitting disk of metal or glass may rest. When the bottle is filled until the fluid reaches above the ledge, and the disk is inserted, under a bell-shaped cover of which it forms a part, a seal is formed which prevents the escape of gas from the inner part of the bottle.



A VARIETY OF NEW TOYS FOR BOYS AND GIRLS

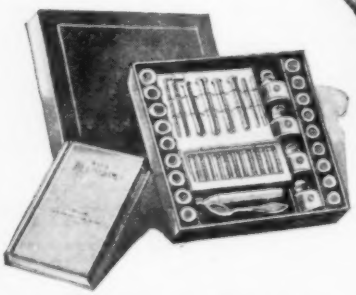


Here Is a New Idea in Hand-Power Carts. The Body at the Rear, When Loaded, can be Dumped by Tilting It Backward, Just Like the Big Trucks That Carry Coal



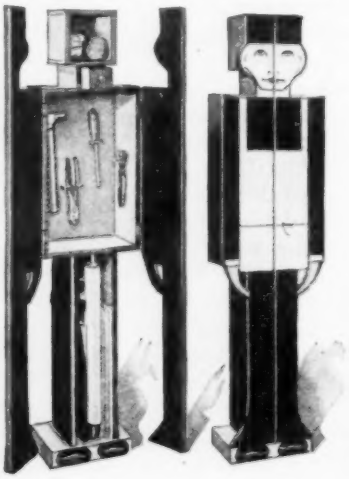
Quaint Bird House with a Roof of Thatch: Houses Like This are Made with Six, Eight, 10, and 14 Rooms. They Cost $8 to $15, According to Size

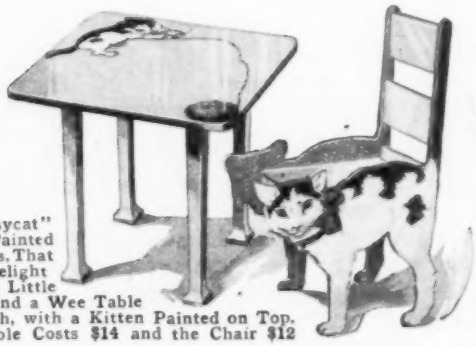
Outfit of Chemicals for Boys and Girls: With It One can Make 85 Fascinating Experiments in Chemistry and Chemical Magic, and Acquire an Interest in Science Besides



When Closed This Tall Slim Chest Looks Like a Carpenter Waiting for Orders. Upon Opening It, One Finds Just the Tools Wanted, and Also Wrapping Paper and Twine. The Price Is $18, Complete

This Handsome Hobbyhorse does Not Simply Rock Back and Forth but He Really Gallops—If Some One will Take Hold of the Handle at the Back and Push Him

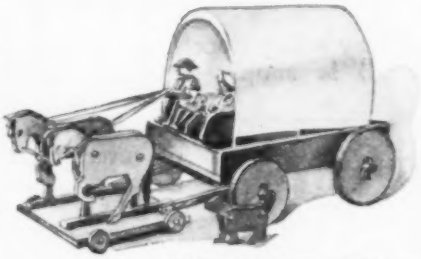




A "Pussycat" Chair, Painted in Colors, That Is a Delight to Very Little Folks, and a Wee Table to Match, with a Kitten Painted on Top. The Table Costs $14 and the Chair $12

AND USEFUL ARTICLES OF INTEREST TO THEM

A Swinging Chair That Children will Delight In Because It can be Stretched Out Flat Like a Couch, Which can be Swung Back and Forth as Before. It is Shipped Prepaid for $2.50



A Truly Picturesque Prairie Schooner Built for Hard Knocks: The Pioneer's Family Are All Inside, While the Dog Keeps Watch Without. The Outfit Sells for $5.25

For Over 100 Years Little Girls have Loved This Doll. It was Brought Long Ago from Poland and Finally Given to the Present Proud Owner, Who Lives in Topeka, Kansas

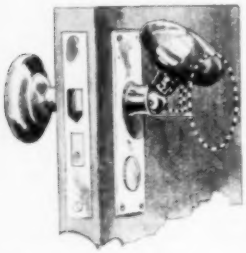
This Pretty Dish for the Dog will Not Break or Upset Easily. The Figure Stands 10 Inches High. Similar Ones can be Had for Cats. Price $5 Each

Two Baby Chairs in One: Fold Up the Legs, as Shown Below, and the High Chair Becomes a Low Seat on Wheels, with a Big Tray in Front for Playthings. Finished in Oak, It Costs $22.50

A Cardboard Advertising Novelty for Children: The Parts of the Puzzle Picture, as Shown at the Left, are Designed to be Cut Out and Assembled in a Frame, as in the Circle Above

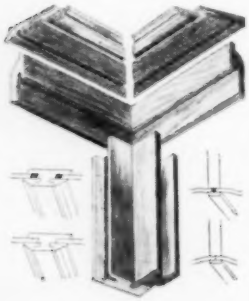
SAFETY DOOR LOCK WORKS BY LIFTING THE KNOB

A new safety door lock, recently invented, is simple in operation and seems to be a desirable means of fastening the doors of bedrooms, bathrooms, offices, and hotel rooms. Closing the door and lifting the knob operates the lock in one direction, while the reverse movement of the knob unlocks the door. One advantage is that the occupant of a room can always be sure whether the door is locked or not, because he can tell this from the position of the knob as soon as he looks at it. It affords a ready and certain method of opening a locked door from the inside in case of fire, there being no key to fumble with or to mislay.



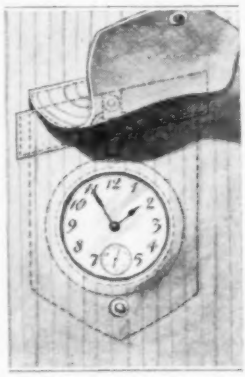
MOLDINGS FOR WALL BOARD WHICH ALLOW EXPANSION

A feature of wall board which builders frequently have had difficulty in overcoming, namely that it tends to contract and expand, has been provided for by a molding manufactured in Memphis, Tenn. There are three principal forms of this molding and three kinds of stops that are combined with it in various ways to furnish grooves into which the wall board may be fitted and by which it is held in place without being nailed. This allows the fiber sheets to expand and contract without unsightly warping. In making panels with these wooden strips, the position of the studding can be disregarded so long as the molding is well secured at either end, for it is strong, and so grooved that it holds the wall board without backing.



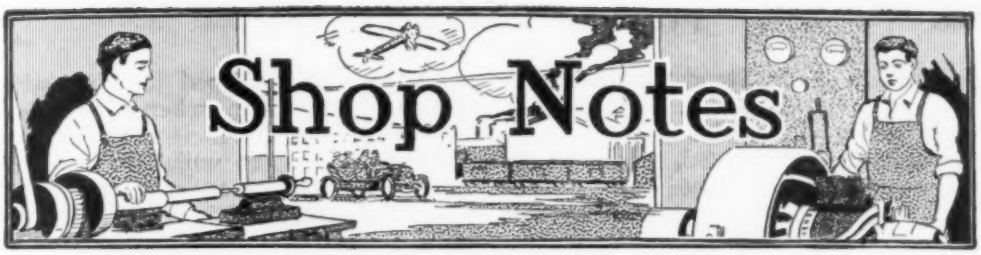
NOVEL WATCH POCKET MADE FOR MAN'S WAISTCOAT

When carried in a waistcoat pocket of a new design lately patented, one's watch may be consulted without being removed. The pocket is of conventional type except that it has a circular opening, covered by a transparent shield, through which the dial of an open-face watch, held within it by a glove fastener, is visible. An outer flap covers the pocket and is secured at the bottom by a clasp. If the latter is not desired, it may be slipped within the pocket, thus leaving the face of the watch exposed.



NEW SPARK-PLUG CLEANER WORKS QUICKLY

Spark plugs may be rapidly freed from carbon and oil by a new cleaning device which does not require the plugs to be taken apart for its operation. It consists of a small tube with a bushing at one end to receive the plug, and a number of loose needles contained within. When the tube is half filled with gasoline and the plug to be cleaned is screwed into the bushing, it is only necessary to shake the tube, when the needles inside pick any carbon off the porcelain, while the gasoline dissolves any oil on the plug. A set of plugs can be thus cleaned in a few minutes, without soiling the hands.



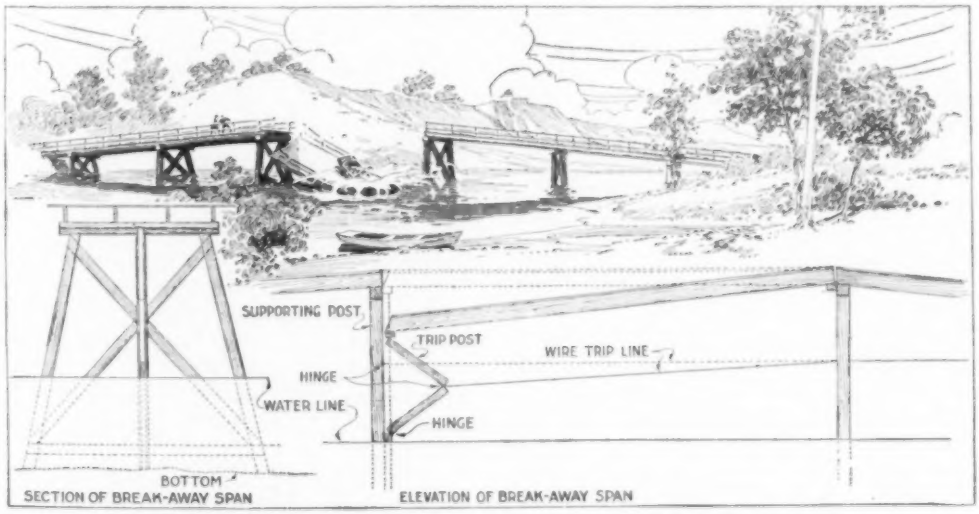
A Collapsing Bridge for the Movies

By RALPH CUMMINS

A MOVING-PICTURE bridge has one span so constructed that it can be broken away, precipitating an automobile, a carriage, or a horseman into the stream. Many movie fans are curious to know by what mechanical means this thriller is effected. Boys and others interested in making models, for play or diversion, will find a miniature bridge of this kind a novelty. A sure means of tripping the section is necessary, for the fall must be timed just right, so as not to spoil the picture and make necessary an expensive "retake." The tripping apparatus, shown in the sketch, is one that I have used successfully on bridges, towers, and walls. The principle is simple: Two hinges are placed on opposite sides of the trip post—a 4 by 4-in. piece upon which one end of the span rests. A piano wire stretched from the upper hinge to a point opposite the break-away section, forms the means of tripping. When an automobile is used, a wire can be run through pulleys in such a manner that the machine trips the break-away span at the proper instant.

Painting Cold-Water Pipes

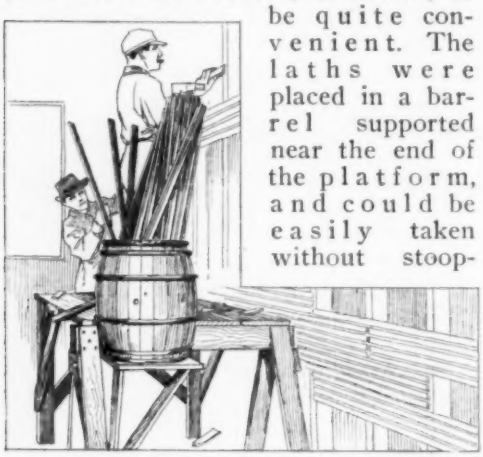
It is very difficult to obtain a satisfactory painted surface on cold-water pipes, because of the condensed moisture which collects on them. The water should be run out of the pipes and a thin coat of shellac applied after the surface has been dried thoroughly. Bronze aluminum, dusted over a preliminary coat of copal varnish, or over the shellac, which dries quickly, produces a neat finish.—A. Ashmun Kelly, Malvern, Pa.



The Car Automatically Trips the Break-Away Span, Precipitating Itself into the Stream

Quickly Made Stand for Lathing

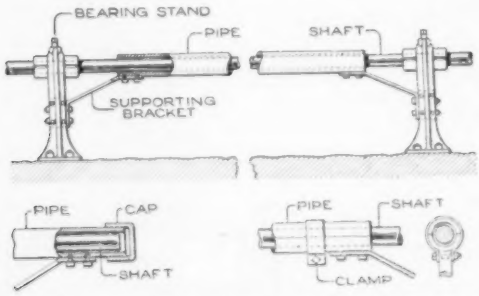
In lathing I found a stand built up on a horse and braced, as shown, to be quite convenient. The laths were placed in a barrel supported near the end of the platform, and could be easily taken without stooping. The platform is light and easily moved. It is so cheaply made that after a job is finished it can be knocked down and only the horse taken to another job, if desired. The barrel used was a nail keg, like those obtainable at most buildings in construction.—John S. La Fleur, Haverhill, Mass.



The Rapid Work of the Lather is Made Even More Speedy by the Use of This Stand

Safety Guard for Exposed Shafting

Suitable coverings for exposed shafting should be provided as a safety measure. If the shafting is already in operation and cannot be taken down handily, a pipe may be cut into halves longitudinally in a keyseating machine and the parts clamped together with straps of sheet iron, when in position. A typical installation is that between bearing stands, to which the pipe is braced with brackets, as shown. Exposed ends of shafting are protected with a pipe and cap, as detailed.



The Workmen are Protected from Exposed Shafting by Pipe Coverings

Locating Trouble in Automobile Starters and Generators

After a season's use, the automobile starter and generator should be carefully examined to make certain that its efficiency is up to standard. The starter may lack the necessary turn-over torque, especially when the engine is cold and spinning is difficult. The generator may heat up rapidly or fail to charge the battery properly. Before taking the motor or generator apart, go over every external connection to see that there are no grounds, breaks, or shorts. Examine the starter foot switch to make sure that the electrical contacts are in good condition. Note, also, the condition of the battery, whether it needs water or acid and that its voltage is sufficient. As for the generator, pay special attention to the relay to see that cutting-in occurs at the proper engine speed. This speed should average eight or ten miles an hour, for most generators. If trouble is experienced with the sticking of relay contact points, a small flat file should be used to smooth the contacts, care being taken to see that they meet evenly. An ordinary finger-nail file will serve the purpose. Still failing to locate the trouble, inspect the machine internally. As a rule, very little difficulty may be traced to the field coils, but a close examination of the armature and commutator is suggested.

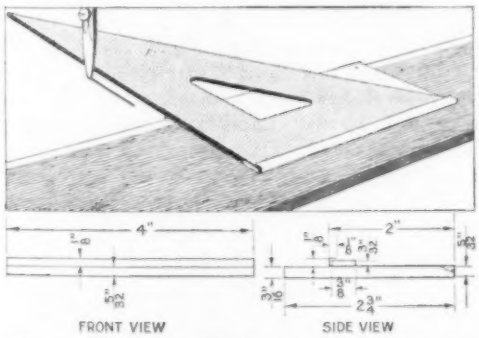
Bad sparking at the brushes is generally a sign of high mica. A ground in the armature winding is caused by contact of the winding with the armature core. A careful examination should show the weak point in the insulation.

The last test to be made is for broken lead wires. Substitute a small piece of sheet metal for one of the

brushes, so that only one commutator bar at a time is touched. A single dry cell should then be connected, through an ammeter, to the metal brush and to the next carbon brush. Turn the armature very slowly by hand, so that the metal brush may make sure contact with each commutator bar in succession. Unless the design is very special, there will be two lead wires soldered to each bar. A reduced deflection will indicate a break in one lead, and no deflection, a break in both, when the metal brush passes over the bar to which the faulty leads belong.—K. M. Coggeshall, Webster Groves, Mo.

Triangle Holder Aids in Inking Drawings

It is often desirable, for rapid work in tracing, to draw ink lines with a triangle over lines that are wet. It is hard to do this without making blots. I made a protector, as shown, with which it is easy to move the triangle over wet lines, at the same time keeping it at right angles to the T-square. The device is made of metal,



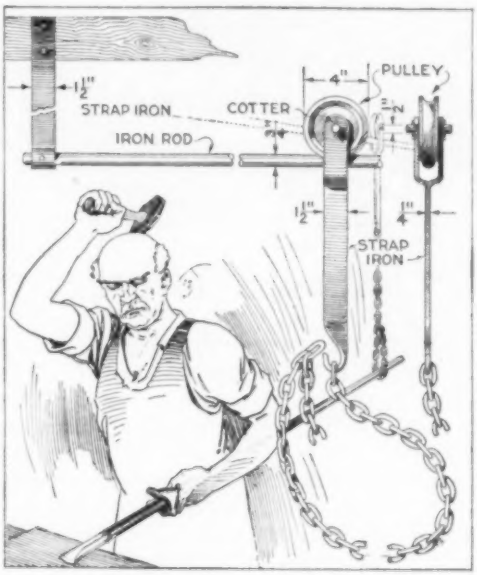
The Device with the Triangle in It is Moved in the Usual Manner

sheet aluminum being preferable. The size may be varied, that indicated being suitable for smaller triangles.—Howard Scott, Jersey City, N. J.

¶A smooth, well-tinned soldering iron transmits more heat than a rough or dirty one.

Traveling Pulley-and-Hanger Support at Anvil

In the small forge shop where long pieces must be handled occasionally, as well as in the shop where drills and



This Support was Made for Handling Long Rock Drills, and Has Many Other Uses

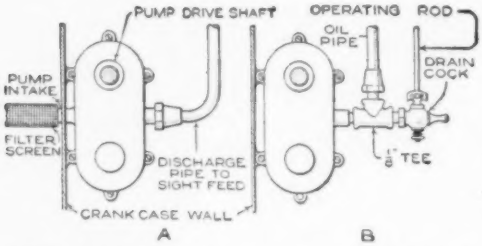
similar tools are sharpened, the pulley-and-hanger arrangement shown in the illustration is convenient. The rod on which the pulley travels is supported from the joists. A forged hanger supports a chain sling which is adjustable to various sizes and shapes of work.—John E. Cahill, Jr., New York, N. Y.

Orchestra-Pit Rail Used as Speaking Tube

Musicians and the leader in an orchestra often wish to communicate with each other, which in a large orchestra is inconvenient. By cutting 1-in. openings in the pit rail at each player's chair in a local theater, and connecting the rail to a tube at the leader's station, means of communication was provided. At more expense, speaking tubes may be installed along the rail, but the plain openings proved a success.—Jack Wolmer, Marion, Ind.

Remedy for Unreliable Auto-Oiling System

Many small automobiles are equipped with a constant-level splash system of engine lubrication in which a shaft-



Frequent Stoppage of the Oiling System was Overcome by the Installation of a Drain Cock

driven gear pump draws oil from a chamber cast in one piece with the lower part of the crank case. This pump discharges the oil through a copper tube to a sight-feed fitting on the dash, from which it goes to the crank case by gravity. In one such case frequent stoppages of the oil flow were experienced, and when the parts were cleaned, little dirt was found, and the system worked temporarily on reassembly. An air lock was found to be responsible, and the change shown in the diagram was made to overcome the difficulty, the old arrangement at A, and the new at B.

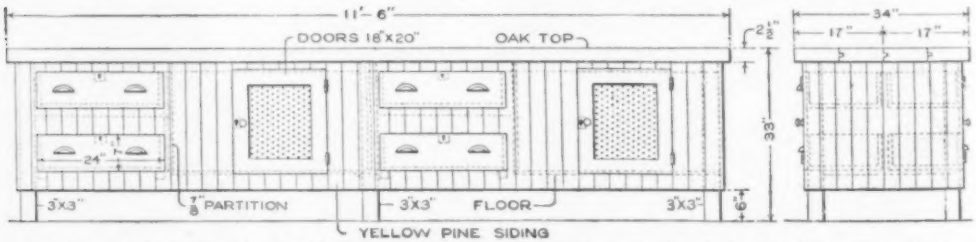
A change in the piping was made, as shown, the other fittings being undisturbed. The regular discharge fitting was attached with a tee. A petcock was placed opposite the discharge and an operating rod for it was run up to the top of the engine. As soon as the oil feed stops, it is but a minute's work to open the petcock, and allow a small quantity of oil to be pumped out. When this is then closed, the oil flows through the discharge pipe, whether the stoppage was due to an air lock or to dirt.—Victor W. Pagé, Bristol, Connecticut.

Testing the Atmosphere in Polishing Rooms

A test for detecting metallic dust in the atmosphere of a polishing room may be made by placing a lighted Bunsen gas burner in the middle of the room, about 4 ft. from the floor. When steel and iron particles float in the atmosphere, the dust comes into contact with the flame, as indicated by the sparkling of the flame. The presence of brass dust is indicated by an intense greenish color. This simple device is valuable for the inspection of blower systems, intended to clear the air.

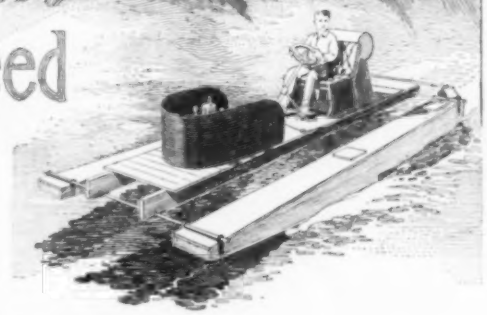
A Workbench for Use Singly or in Multiple

This heavy workbench was designed for use in engine houses and small railroad shops where room is at a premium, and can be adapted for the use of machinists, carpenters, pipe fitters, boilermakers, and other mechanics who need a substantial bench. It accommodates four men, but can be arranged to be used in two sections. Two drawers are provided for each workman, and also a large cupboard with a screened door. The construction is such that the bench can be made quickly by machine or hand process, and there are no out-of-the-way corners to catch dirt.—Joseph A. Long, Sunbury, Pa.



A Substantial Workbench of This Type may be Used in Single or Double Units for Heavy Shop Work

A Hydroplane Catamaran Built for Speed



By L. B. ROBBINS

THE building of this 16-ft. power boat of the catamaran type, involves no special skill in boat construction, and it is designed to be made without the bending of planks, ribs, etc., by mechanics having only a fair knowledge of handwork with tools. The craft is for use on fairly smooth water, and with a 4-hp. motor, develops a speed of 15 miles an hour. For greater speed with a more powerful motor, the size of the catamaran must be correspondingly increased. The bottoms of the hulls have steps, turning them into simple hydroplanes, and increasing their speed quality. The open structure simplifies the mounting of the power plant and its driving connections, as compared with conditions met in ordinary motorboats. The perspective sketch in the headpiece of this article, and the plan and elevations, Figs. 1, 2, and 3, show the general arrangement of the parts.

Cut the sideboards from ¾-in. pine. They fit between the top and bottom, and over the ends. Begin the construction with the hulls, detailed in Fig. 4. All of the wood used should be first-quality stock. Plane the edges square, and fasten the 1-in. battens into place with screws, applying white lead under them, on the inside of each sideboard, except at A, Fig. 4, where a bulkhead supports the structure. Coat the inside of the sides with marine paint.

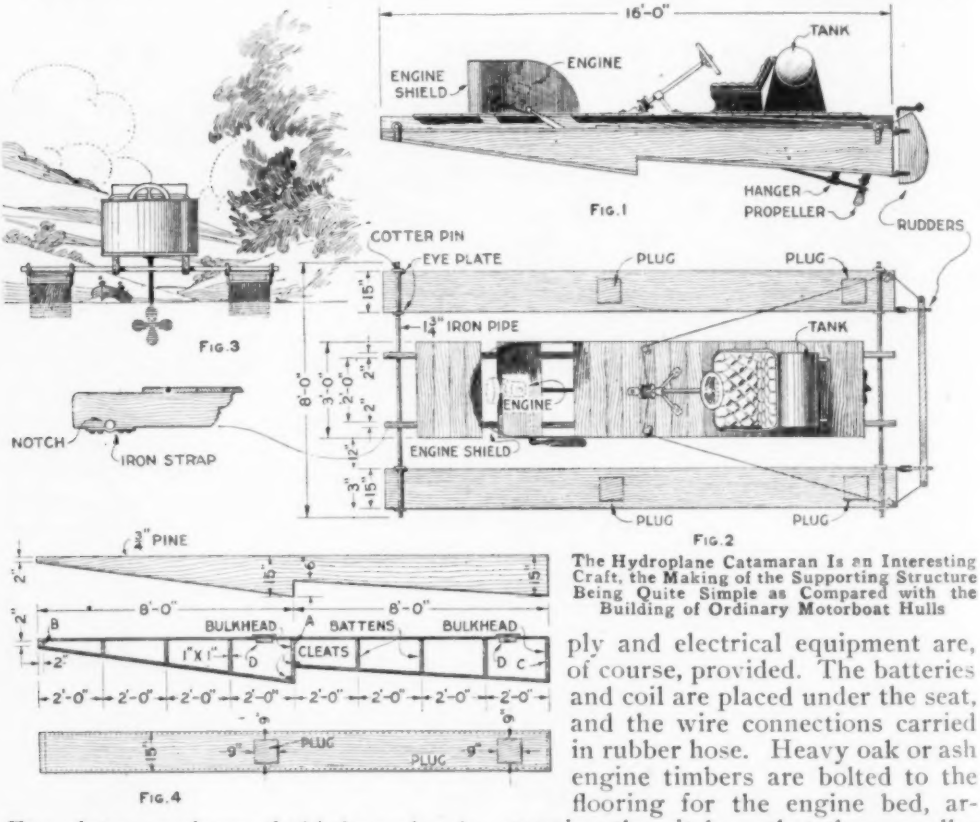
The bow piece B is of oak, 2 in. sq. and 1 ft. 1½ in. long, and the stern piece C is of 1-in. pine. Fit the pine bulkhead A water-tight, the rear surface of it flush with the step. Fasten the end and bow pieces, and the deck board, painting the inner surfaces. Use 2-in. brass screws, countersinking the heads, and place a strip of muslin soaked in white lead between all joints. Cut the holes D, and fit them with plugs. These holes are for filling in or pumping out ballast to distribute the weight properly. Scrape off the excess white lead, sandpaper the surfaces, and fill the screw holes with white-lead putty, and apply two coats of marine paint to the hulls. Next construct the deck of matched boards mounted on two 2 by 6-in. spruce timbers, 16 ft. long. These must be of fairly straight grain, and of very good quality. Set the timbers on edge and taper them to 5 in. at the ends, into a truss effect. Place the timbers, as indicated, 2 ft. apart, arched edges uppermost, and nail on the ¾-in. matched pine deck boards 3 ft. long. Leave 1 ft. of the timbers uncovered at the ends. Leave two openings forward, the size and position of them depending on the motor used. The center of the engine bed is 4 ft. 6 in. from the bow and heavy boards are laid for its support. Notch the timbers, 6 in. from the ends, and fit them with iron straps, bolted on, as detailed, to accommodate the supporting end shafts.

An old automobile seat and round gasoline tank is mounted on the frame, as shown, making certain that the bottom of the tank is higher than the carburetor of the motor. The seat and tank are set about 10 ft. 6 in. from the bow, to obtain an even distribution of weight. An auto steering wheel and column, fitted with a wooden drum,

keyed in place, is used. A bracket near its base supports the post.

The deck is next fitted to the hulls.

The installation of the motor will depend upon its style and size. The usual connections of the gasoline sup-



The Hydroplane Catamaran Is an Interesting Craft, the Making of the Supporting Structure Being Quite Simple as Compared with the Building of Ordinary Motorboat Hulls

ply and electrical equipment are, of course, provided. The batteries and coil are placed under the seat, and the wire connections carried in rubber hose. Heavy oak or ash engine timbers are bolted to the flooring for the engine bed, arranging the pitch so that the propeller will rest about 6 in. under water. Bolt the hanger for the propeller shaft to the floor boards, as shown in Fig. 1. A spray hood, of canvas over an iron frame, or of sheet metal, protects the motor.

Eye plates, as shown, hold the end rods carrying the long timbers. The plates are secured with screws, 6 in. from the ends of each hull. An 8-ft. length of 1¾-in. galvanized-iron piping is slipped through the sets of eyes, and through the notches of the deck timbers; cotter pins hold the piping in place. The straps at the ends of the timbers keep the deck frame in position on the piping.

Two rudders of thin oak or of sheet metal, as shown in Figs. 1 and 2, are hinged to the inner edge of each hull. An angle of strap iron at the upper edge of each rudder is bolted loosely to a bar of iron or wood, so that the rudders operate together. The steering rope is rigged through pulleys, as shown, and wound around the drum on the steering column.

Punching Hard Sheet-Rubber Washers by Hand

Vulcanized, or hard, sheet rubber may be worked with shears or ordinary leather punches, using stock ⅛ in. in thickness, by gently heating the part to be cut, and sometimes heating the tool also. To cut a hard-rubber washer from a piece of flat stock, use two leather punches, a large one to cut out the blank, and a smaller one to punch out the center hole. Lay the

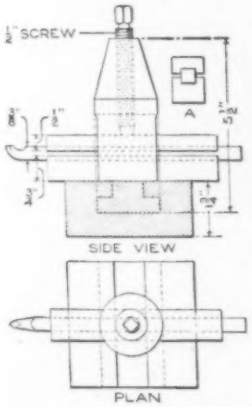
stock on a flat piece of lead, or other fairly soft metal, heated just sufficiently to cause the rubber to become pliable, so as not to crack when the punch strikes it. The washer will cool flat if laid on a flat surface. Hard-metal tubing is suitable for cutting the stock, if properly sharpened, and other shapes may also be cut.—F. L. Whitaker, Olney, Ill.

Padded and Flexible Paper Weights

For weighting large maps and drawings, standard square 2 or 2½-in. nuts, with a layer of cotton waste or cloth padding, about ¾ in. thick, evenly wrapped about them and covered with strong paper or cloth, are excellent and inexpensive. A smooth leather bag, 3 in. square, filled with small lead shot or dry sand and securely sewed, makes a good paper weight that is very flexible, and if accidentally dropped on a drawing, does it no injury.

Tool Holder for High-Speed Steel

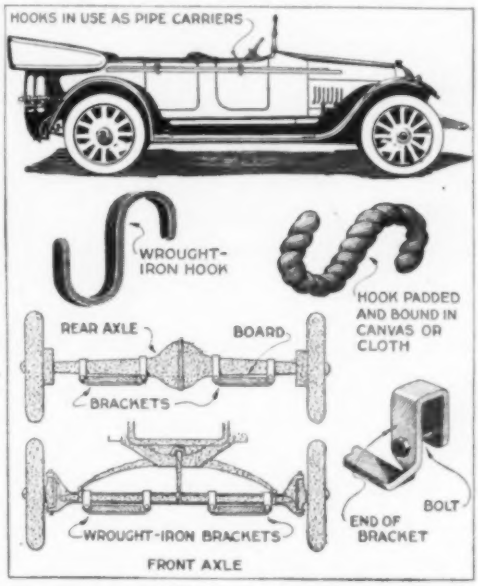
By the use of this tool holder, high-speed steel need not be broken into short lengths, but may be fed forward as required. The holder was designed for a medium-sized lathe tool post, and the device may be made strong enough for use on a shaper or planer, and to withstand heavy cuts. It consists of two sliding members of machine steel, grooved to fit the tool steel, as indicated at A, and is clamped in the tool post in the usual manner.—C. A. Gilson, Niles, Mich.



¶Undue forcing in photo development is indicated by a tendency of the fixed prints to sink in the wash water.

Detachable Hauling Brackets on Passenger Auto

Two simple methods of adapting an automobile quickly for business purposes are shown in the sketch. The S-shaped wrought-iron hooks, padded in cloth or canvas, are used by a plumber to convey long sections of pipe handily. The brackets are used by a paper hanger in transporting scaffolding. They are made of wrought iron, as shown, to conform to the axles of the car.—G. A. Luers, Washington, District of Columbia.



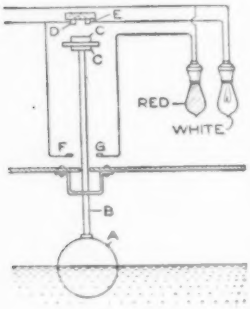
These Devices Are Useful in Carrying Pipes, Ladders, Fish Poles, and Similar Articles

Hay Carrier Rigged to Handle Excavation Dirt

In digging a cellar under my house, how to remove the dirt was a problem. I made a track for my hay-carrier tripping pulleys and hanger of 1 by 4-in. boards. I then made a strong box, 1 by 2½ by 3 ft. in size, and attached it to the carrier in such a way that by loosening a hook it would dump easily. With this arrangement one man took out an average of 7 cu. yd. a day.—J. H. Knight, Cumberland, Ohio.

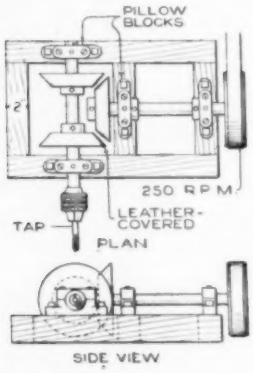
High and Low Water-Level Indicator

This easily made water-level indicator is in daily use and was worked out by me. Where the supply tank is located so that it is not visible from the pump house, such a device is reliable and convenient. Branch wires from an ordinary lighting circuit are run to the tank and to the pump house, office, etc., as desired. The copper float, at A, is fastened to a rod, B, to which are attached the plates C, with an insulating strip between them. The clamp and the hole in the tank act as guides to hold the rod in a vertical position. When the tank is full the lighting circuit is closed by bridging the space at the contacts D and E, lighting the white globe. When low water is indicated, the space at F and G is bridged, and the red globe is lighted.—James E. Noble, Toronto, Can.



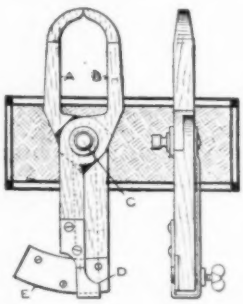
Device for Tapping Small Machine Parts

A machine which was found useful in tapping quantities of small parts is made as follows: Turn off one side of each of three 5-in. grooved pulleys, at an angle of 45°, making cone-shaped wheels. Remove the chuck from a breast drill, and thread one end of a ¾ by 12-in. shaft to fit it. Upon this shaft mount two of the pulleys, 4 in. apart, facing each other, and equally distant from the center. A second shaft, at right angles to the first, takes the third bevel pulley at one end, the pulleys being faced with leather. The leather is drawn tightly over the shellacked face of each pulley, bound down at the back with wire, and later trimmed off. A wooden frame of 2 by 4-in. stock forms the support of the two shafts, which run in pillow blocks. The shaft carrying the friction wheel is belted to the source of power and runs continuously, while the chuck shaft runs ahead when pushed in, and reverses when pulled in the opposite direction. The speed should be about 200 to 250 revolutions per minute.—Dexter W. Allis, Whitman, Mass.



A Caliper with Locking Scale

Mechanics who have had experience with calipers will readily perceive the advantages of the indicating feature of this homemade caliper. I made this instrument of wood for gauging the top and back of a violin in course of construction, and it has many other uses. The legs A and B are fitted together at the lap joint C with a washer, and secured with a screw and knurled nut. The movable arm D is made of sheet metal, and is swung from the bolt that secures the legs, the thumbscrew locking the arm of the scale E. The latter is a piece of sheet metal fastened to the leg A, and its extension, with screws. A pointer is also fastened to leg B. When the caliper is completed, the pointer D is locked against arm A, and the indicating marks scribed deeply on the pointers. A scale may also be marked on the part E. Ordinarily, the arm D is clamped on E, as desired, the opening gauged by the pointers.—William A. Robinson, Waynesboro, Pennsylvania.



Repairing Small Tire-Tube Punctures

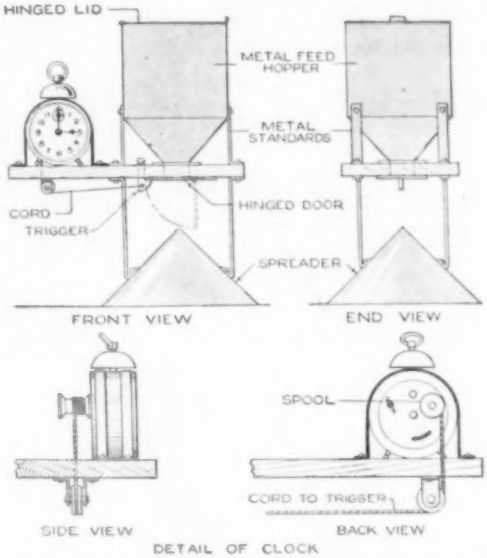
Many automobile-tire repairmen, in repairing a pinhole puncture, use a patch several times as large as the injury. This requires very heavy pressure to obtain a smooth surface. A better way is to trim the hole just enough to remove all ragged edges. Clean it thoroughly and apply cement. When the cement has dried, force a small thread of gum through the hole with an awl, trimming it flush on the outside. In curing, use just enough pressure to hold the tube firmly on the tube plate; tracing cloth laid on the plate insures a smooth surface.

Automatic Poultry Feeder with Clock Control

Uniform quantities of feed may be fed to poultry with a minimum of attention by the person caring for them, if the simple arrangement shown in the illustration is installed in the poultry house or yard. The grain or other feed is placed in the metal hopper, the device being supported on the rafters or other suitable support. The hinged door at the bottom of the hopper is controlled by a trigger, connected to the clock alarm winder by a cord. When the alarm is released, the cord is wound on a spool fixed on the alarm winder, and the trigger is freed. The feed falls to the conical spreader, and is scattered to the ground.

The hopper may be made in various sizes, and several may be rigged with the same clock control. It is mounted on a 7/8 by 9 by 18-in. board, on one end of which the clock is fastened, by a strap of iron. The spreader is supported from the board by metal rods. The hole in the bottom of the hopper is 2 in. in diameter, and the spreader is 12 in. wide.

A spool is secured to the alarm winder of the clock and the cord controlling the trigger is wound on it. The clock is wound up, and the alarm set for the desired time. When the alarm is freed, the spool turns with the alarm winder, winding up the cord, and releasing the trigger, and feed. The fowls soon become accustomed to

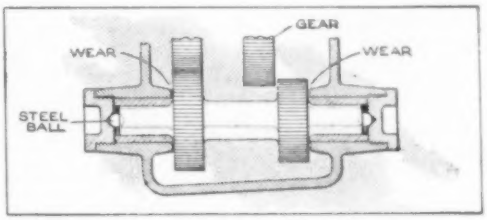


The Poultry Feed is Scattered on the Ground from the Suspended Hopper and Spreader, When the Alarm Mechanism Releases the Trigger

the ringing of the alarm, and respond to it quickly.—C. C. Holmes, Detroit, Michigan.

Ball Bearings Overcome Thrust in Gear Shaft

The countershaft in the gear box of a motorboat power plant was subjected to a great end thrust when the gears were engaged. This caused considerable wear on the gear box, as indicated. Hardened steel balls were placed at each end of the countershaft, slightly countersunk holes being pro-



Steel Balls Set in Conical Bearings Take Up the End Thrust

vided in both the shaft and the housing. They took up the thrust in both directions, eliminating the wear.

Handle Forms Coupler for Train of Trucks

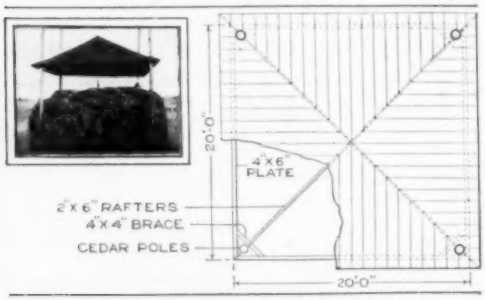
By arranging the tongues of shop trucks so that they may be set in

One Man can Draw a Train of Small Trucks When They are Coupled Together

sockets on the rear of similar trucks, forming a train, one man can handle a number of them when empty. The end of the tongue and the socket are protected by metal fittings.—J. J. O'Brien, Buffalo, N. Y.

An Adjustable Hay Shed

As a protection for hay stacked in the field, the hay shed shown in the illustration proved effective. It was built by setting four heavy cedar poles

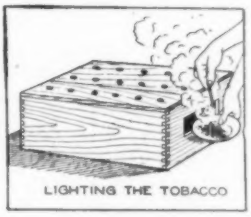


The Roof is Raised and Lowered by Sliding It on the Poles, in Which Heavy Supporting Bolts are Inserted

in concrete at the four corners of the stack and then constructing a roof to slide up and down on the poles. A desirable location for the haystack from year to year was determined upon, and the shelter built at that place. Holes were bored 2 ft. apart in the supporting poles, and the roof is set at various heights by means of bolts placed in the holes. The roof is of comparatively light construction so that it is not difficult to raise or lower it. The tops of the poles are guyed together by means of wire braces.—W. E. Frudden, Charles City, Iowa.

Fumigating Plants with Tobacco Smoke

The accumulation of insects or scale on plants should be held in check by fumigating them at intervals. An efficient means of overcoming the pests is by the smoke of tobacco. A suitable arrangement whereby this can be done



either in the house or outside, is shown in the sketch. Bore 1-in. holes in the top of the box, and cut an opening in the end to admit a saucer. Make a cloth bag to be slipped over the box and tied closely, inclosing the plants, which are set on the box, above the holes. Light the tobacco on a saucer, and put the latter through the opening, so that the smoke may rise around the inclosed plants. The bag is carefully taken out of doors to remove the smoke remaining in it. A light fumigating performed twice is better than fumigating heavily, with possible injury to the plants.—F. H. Sweet, Waynesboro, Va.

Paper Drinking Cups as Containers for Wood-Finishing Materials

In a shop where many kinds of stains, paints, etc., are used, considerable time and material are wasted in cleaning bottles, cups, or other containers. A satisfactory solution of this

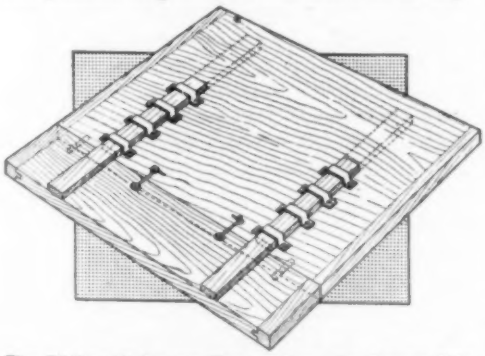
problem is the use of paper drinking cups. They cost less than one-half cent each, and may be thrown away after being used once, or used several times for the same kind of stain.—P. Gaffney, Chicago, Ill.

Leather Covering for Auto Magneto Coupling

In an automobile, a small leather covering over the coupling connecting the magneto to the engine is desirable. The dirt and grit will in this manner be prevented from working into the parts of the coupling. The boot is made of thin flexible leather, formed in the shape of a tube, and clamped to the two shafts by means of soft-iron wire.

Extension for Drafting Board

A drawing board of considerable size was found too small for drawings which were to be made from time to time, and an extension was built, which could be removed quickly. The wood used was the same as that in the board, and the ends were fitted with cleats, to prevent warping, and to provide a good edge for the T-square. Metal straps hold the sliding pieces under the board. The extension is held rigid by two deep dowels, set in the joined edges. Hooks hold it firmly

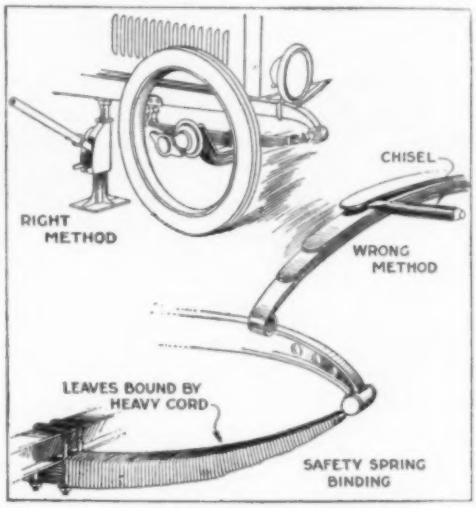


The Sliding Strips are Fastened on the Lower Side of the Board, and the Hooks Hold the Extension in Place

against the edge of the board. When not in use, the sliding strips are kept under the board.—Ralph W. Sherman, Burlington, N. J.

Proper Care of Automobile Springs

A practical illustration of the care of automobile leaf springs is that frequently employed on racing cars, the



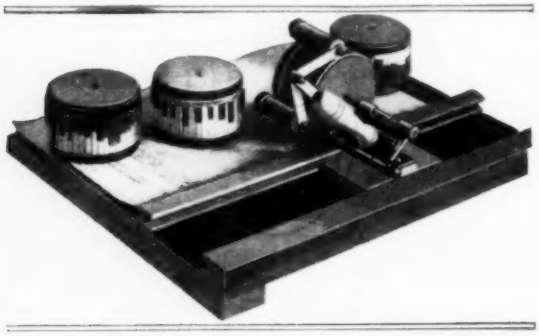
The Leaves should be Properly Released, and Not Pried Apart with a Cold Chisel

springs being wrapped with heavy cords to crowd the faces of the leaves firmly together, increasing the frictional contact, as shown in the sketch. Mechanics, with a hammer and cold chisel or crowbar, sometimes pry apart the leaves of the springs to lubricate them. This method often produces permanent sets or bends. The correct method of separating the leaves is by releasing the clips and staybolts, and placing a jack between the frame and floor to raise the load. Beeswax, or this and powdered resin, heated, is suitable for the springs, if applied as suggested. The unsightly sagging rear of many cars is often caused by failure to maintain proper contact between the leaves, and in some instances by abuse through methods of lubrication. To insert a lubricant, such as oil, between them, may cause distortion and frequently broken springs.

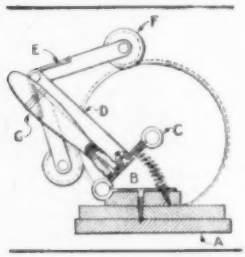
¶A strip of canvas glued in several layers to the flanged driving pulley of a motorcycle overcomes the slipping of the belt.

List-Printing Machine for Use with Rubber Type

It was found difficult to print a long list of names by the use of the flat type board ordinarily used with rubber type, and, since many copies were to be made, the machine shown was devised. It requires a comparatively small ink pad, and the rollers for the type can be used for many forms of this kind of printing. The rollers were spaced on their circumferences so that the lines of type registered properly in the forms to be printed, which were ruled. Ordinarily it will be necessary to space the type lines at standard spacings, or at spacings determined upon for special reasons. The type may be glued directly to the rollers, or to paper strips, which are then mounted on the rollers. The type rollers are inked by felt-covered ink rollers mounted in a hinged metal angle. The printing device is carried on a sliding block, fitted into a groove on the baseboard.



This Printing Device was Made for Duplicating Lists of Names, and Has Other Uses

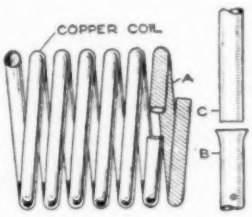


The detailed construction of the printing device is shown in the sketch. A is the sliding piece which engages the grooves of the baseboard. One butt hinge, B, and half of another, are fastened with screws. The half hinge carries the shaft C, which is the pin of the hinge. A strip, D, holds the angle E, carrying the ink rollers F. They are held at proper pressure on the type by the spring at E, and are kept from dropping between the rows of type by small flanges at their ends, bearing on the wooden edge of the type rollers.

The printing roller is set firmly on the shaft. The first printing line is indicated on the side of the roller, as a guide in starting the impression, the roller being "spotted" by the fingers of the right hand, which holds the handle. The handle G is pushed forward, and the additional sheets are fed against the guide strip with the left hand. The coil spring holds the printing roller off the paper on the return stroke, and tends also to make the impressions more nearly uniform on the forward stroke. —T. T. Sturgeon, Los Angeles, Calif.

Repairing Leaky Copper Heater Coils

Leaky or burned-out copper water-heating coils, such as are used in most water tanks, can be repaired either by brazing a small hole, or, in case of large leaks, a new piece can be inserted. The burned-out part is sawed off, as at A, the shading indicating the burned-out section. Discarded coils from which good parts may still be cut, are used in repairing. One of the ends to be joined is spread with the round head of a machinist's hammer, as at B. The other end C is set into the funnel-shaped part, and, backed with asbestos sheeting, is put under the blowtorch flame. At white heat, using plenty of borax, the spelter is introduced about the joint, fluxing with the copper. At the same instant, the flame must be shut off, to avoid melting the copper coil. Heater coils repaired in this manner are nearly as good as new.—Ralph W. Tillotson, Erie, Pa.



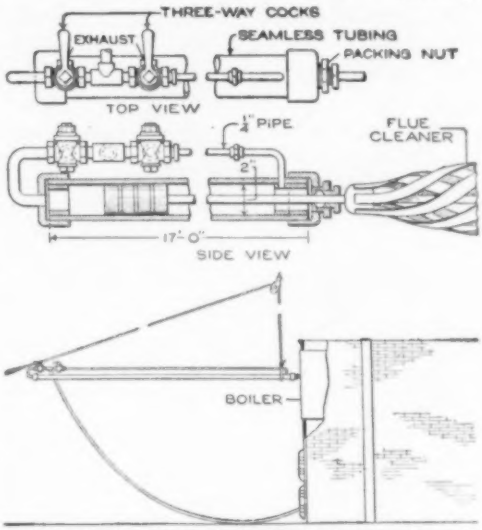
Keeping Down Dust on Concrete Floors

Mopping of some types of concrete floors is objectionable because the water is retained for a considerable time, causing dampness. In other instances the floor wears off, producing a disagreeable dust. By cleaning the floor thoroughly, and painting it with several coats of boiled linseed oil, allowing plenty of time for them to dry, the surface becomes filled. It wears to a smooth polish and the floor may be kept clear of dust easily, by mopping it.

Steam-Operated Flue Cleaner

A handy labor-saving device was rigged up by a fireman in a local boiler room, the details of which are given in the sketch. The boiler it is used on is 16 ft. long, with 56 flues 3½ in. in diameter, and it is quite a job to scrape the flues twice a week with the usual scraper. To make this steam-operated flue scraper, he used 2-in. seamless steel tubing, cut 17 ft. long. On each end he fitted a cap, and a packing nut on the forward end. Next he molded a piston of babbitt metal, 3 in. long, cutting grooves for two rings taken from a small motorcycle engine. A hole was then tapped at each end of the 17-ft. tubing for the steam pipes. A piece of ½-in. pipe was attached at the back end, with a suitable fixture to fasten to a steam hose. Two three-way lever cocks were attached as shown, and ¼-in. pipe run from the lever cocks to the forward end. A ½-in. pipe was used as a piston rod, to which the scraper was fixed.

In use, a rope is fastened to the end bearing the scraper, as shown, and run through a small pulley fastened to the ceiling. The scraper is started in the tube, and then the operator simply holds against the cylinder and opens the end cock, permitting the steam to drive the scraper through the flue. Then he opens the same cock to the exhaust position, and at the same time turns steam into the cylinder through the other cock, which forces the scraper back. By means of the rope and pulley, all flues are quickly

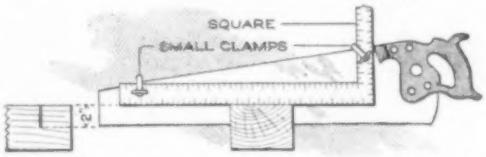


Anyone Who has Pushed a Tight Scraper through Boiler Flues will Appreciate the Labor Saved by This Device

reached. The device is used at from 40 to 90-lb. pressure, as the firemen find convenient.—R. S. Matzen, Fort Collins, Colo.

Depth Gauge on a Hand Saw

In making the saw cuts for joints in timber, much time can be saved, and the job made more nearly uniform, by using a depth gauge on the hand saw. A simple contrivance for this purpose is made by clamping a steel square on the side of the saw, as shown. By adjusting the square properly, cuts may be made which are deeper on one side than on the other. When this kink was used by a carpenter recently, his fellow workmen immediately fol-



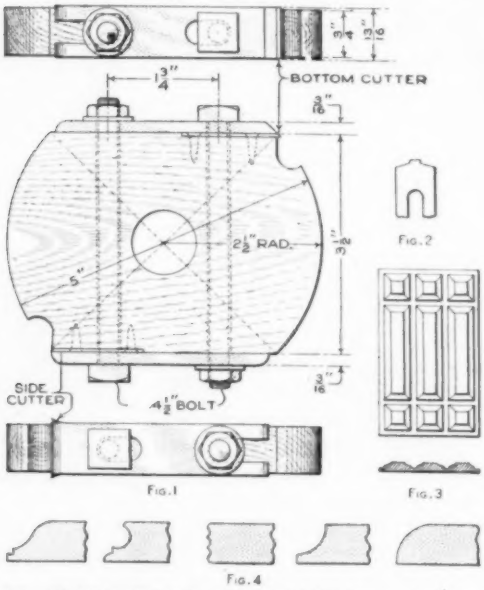
The Depth of Saw Cuts is Gauged Accurately by the Use of This Simple Device

lowed suit by rigging up devices in imitation of it.—J. V. Romig, Allentown, Pa.

A Molding Head for the Circular Saw

By CHARLES A. KING

THE modern circular-saw table, with its tilting top, its ripping, cutting-off, and mitering devices, and its movable throat, is an almost indispensable tool, but its possibilities either



The Molding Head Is a Useful Addition to the Circular Saw Table, Especially in the Small Shop

are not realized or are ignored in many smaller woodworking shops. A variety of jigs and attachments for the circular-saw table may be made which will greatly broaden its range of usefulness. The head herein described, if accurately made, with knives properly shaped, tempered, and balanced, will be found efficient for many purposes.

The low cost of making a head of this sort, compared with the cost of the patented heads upon the market, will permit several of them to be made and kept on hand for special work; they are especially valuable in small shops, where there are no machines but a circular-saw table.

In making the head, select a well seasoned piece of maple, or other very hard wood, a little less in thickness than the width of the knife it is expected to carry, and cut it to a circle a little larger than the desired dimensions, about 5 in. Bore a hole in the center of this circle, to fit the spindle of the saw arbor. The roughly shaped head may then be placed upon the spindle and the collars set tightly up against its side. A rest for a turning tool should be devised, and, after starting the machine, the edge may be turned until the head is of the desired size.

Remove the head from the spindle and draw diagonals, as shown in Fig. 1, at angles of 45° with the direction of the grain, and indicate the portions to be cut off at the upper and lower edges. Cut away the segments, and straighten the edges until they are parallel with each other and square with the sides of the head.

Locate upon each side of the center, and 1¾ in. apart, the centers for two ⅜-in. holes, which pass through the head at right angles with the direction of the grain of the wood. These must be placed at exactly the same distance from the center, and bored carefully from each side until the holes meet. Cut out places for chip clearance, as shown, making the cut at right angles with the straight surfaces.

Fit a 5/16-in. bolt of proper length into each hole, and place a washer and nut on it. The head should now be put in place and the machine started up to see if the head runs smoothly. Usually there will be no trouble, but if the head jumps it should be balanced by boring small holes in the wood upon the heavy side until it runs with little or no vibration. If the bare head runs as it should, but vibrates when the cutters are in place, it will be known that the trouble is with them.

The cutters may be ground, or forged, from regular sizes of tool-steel blanks, as indicated in the sketch, but if such are not available, heavy worn-out files may be used. The knives should be slotted to permit endwise adjustment.

If it is desired to make a grooving head, the straight cutter should be 1/16

in. narrower than the width of the desired groove; the other, being the lip, or scratcher knife, should project slightly beyond the edge of the straight knife, to perform the same function as the lips of an auger bit, which enter the wood ahead of the cutters, to prevent the latter from tearing the grain of the wood.

The points of the lips may be swaged so that only their ends will come in contact with the wood, as friction of the wood against the back of their edges may injure the temper. The form of the bottom cutter may be varied within a wide range of designs, suited to other work than cutting grooves. For instance, one shaped like Fig. 2, used with a lip cutter, will make a good design for a checkered panel, like Fig. 3; or the panel may be carried diagonally over the knives, making diamond-shaped checks, and by using different-shaped knives, the head may be adapted to a number of decorative and constructive uses. If a groove narrower than the thickness of the head is to be cut, the knives will have to be made long enough to cut the depth of the groove before the head reaches the surface of the wood.

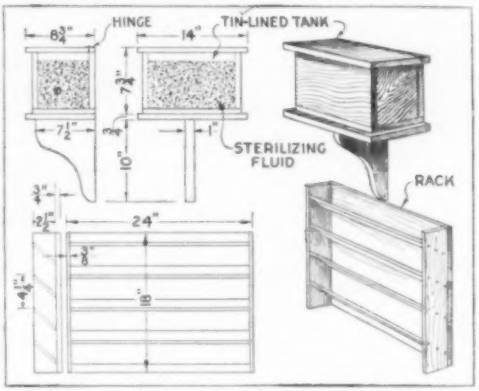
Knives may be made in pairs, for molding the edges of shelves, for panel moldings, surface moldings, quarter-rounds, and scotias, as indicated in Fig. 4. One essential in the fitting of each pair is that they balance perfectly, as otherwise it will be impossible to make even fairly smooth work.

The head described is ¾ in. thick, but it may be made as thick as the distance between the collars upon the spindle will permit, and in some cases, the knives may project beyond the sides of the head.

A head of this type, 5 in. wide, if fitted with slotted adjustable knives, will make a satisfactory jointer or molding head, which can be used in many ways. An arrangement of springs, or pressure bars, may be devised which will hold the wood firmly against the knives and reduce the vibration of the wood to a minimum, besides giving added safety to the operator.

Rack and Case for Sterilizing Shop Goggles

In a shop where the workmen were required to wear safety goggles at

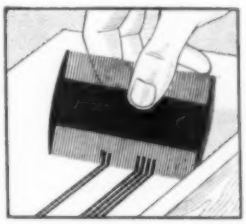


This Sterilizing Tank and Rack were Provided for the Care of Shop Goggles for General Use

various times, a number of pairs were provided for general use. For hygienic reasons these were sterilized before being used again. A tin-lined tank, mounted on a bracket support, contained the sterilizing fluid, and the goggles, after being removed from the fluid, were placed on a rack, made of ⅜-in. wood, as shown.—B. A. Donley, Renovo, Pa.

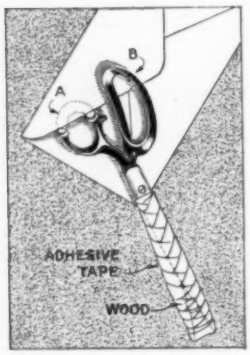
Comb Used as Ruling Pen

In an emergency a fine-toothed comb will serve as a ruling pen for drawing two or more parallel lines at one operation. Five-lined music scores, cross-section and profile papers, borders for drawings, and various classes of decorative designs can be made with this device. Bevel slightly the edges of the teeth in contact with the paper, to give straighter edges to the lines. The teeth on one side of the comb, cut down to half length, afford a multiple stylus for making carbon copies.—H. L. Wiley, Portland, Ore.



Pair of Scissors Used as Envelope Sealer

A useful envelope sealer was made in an emergency, when a large number of envelopes were to be sealed. In an old pair of scissors a small piece of wood was inserted between the blades, as indicated, and the blades bound with electric tape. A string was wound around the top of one of the handles A. The string was moistened and inserted under the right end of the flap, and drawn along, the handle B pressing down the flap and sealing it.—Wilfred Reeves, Toronto, Can.



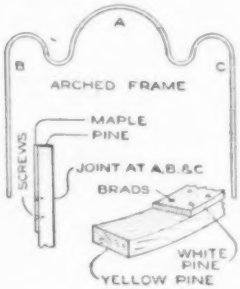
Tray for Storing Mica Washers without Damage

Mica washers become ruined quickly if kept loosely in a box, or other container, and the tray shown in the sketch was made to care for an assortment of them. The box is 5 by 8 by 10 in. in inside measurements. The washers are placed on dowel rods, mounted in a 7/8-in. board that is fitted loosely into the box. A long screw hook was fastened at the center of this board so that the assortment may be removed quickly, using the screw eye as a handle.—L. M. Drake, Daytona, Fla.

¶Water made slightly acid with muriatic acid will clean and restore the brightness of gold-leaf gilding; this method is used by sign painters.

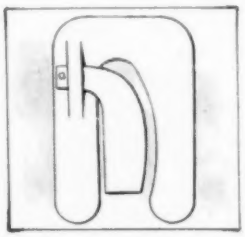
Reinforcing a Light Wooden Triple Arch

I had occasion recently to make a wooden arch for the purpose of decorating with miniature incandescent bulbs. The arch, shaped as shown, was 7 ft. from B to C, with curves of 1¼ by 2-in. material. The standards were of white pine, but the arch itself was of yellow pine, a wood that is somewhat brittle. I secured a lot of thin wood from orange crates, and glued it on the curves with its grain across the yellow pine. Brads were used to hold the strips. To facilitate handling in transportation I divided the arch at A, B, and C. The parts were joined with pieces of maple, secured with screws. This method of strengthening the arch was so effective that I carried it, in a bundle of four sections, a distance of 17 miles on the trolley car and erected it without a split developing.—James M. Kane, Doylestown, Pa.



Erasing Shield Adjustable to Various Lines

The advantage of this erasing shield, which I made for my own use in the drafting room, is that it is adjustable to many shapes of lines, even in intricate drawings. It may be made of thin sheet metal, preferably aluminum, or of celluloid. The central piece is slipped through openings cut in the main portion and is prevented from falling out by a small knob, pressed into the surface at the end.—W. K. Creson, Newcastle, Ind.

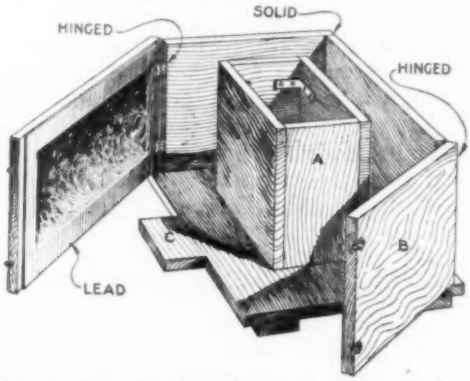


Bracing a Long Droplight Gas Fixture

On a long gas pipe, extending vertically from the ceiling, a brace was found necessary. It was provided by building up a right angle of lighter pipe and fitting it to the main pipe, so that the brace joined it about 4 ft. from the ceiling and extended vertically about 1 ft. from the main pipe. It was fastened to the ceiling with a pipe flange.—M. K. James, Chicago, Ill.

Lead Form Varies Face of Concrete Blocks

In a homemade wooden form for making concrete blocks of the hollow type, used on porch and column foundations, the faces of the blocks were varied by making the corresponding side of the form a frame with a lead panel. The form was built up in the usual way, of 7/8-in. wood. The core A was braced with angles, and the outer form B was hinged at two of the corners. The corner at which it opens was provided with catches. The lead face was made of a sheet of lead, 1/8 in. thick. It was hammered into various forms, each block, or group of several blocks, being made slightly different.



The Lead Panel is Shaped so as to Produce Various Faces on the Concrete Blocks

The cast block is set aside to dry on the base C. A block 8 by 10 by 12 in., with walls 2½ in. thick, is suitable for porch columns.—Fred Quantmeyer, River Vale, N. J.

Nonwarping Frying Plate for Electric Stove

An electric stove was provided, when purchased, with an aluminum pan, as shown at A. The first time it was used

The Cast-Iron Hearth of a Stove Proved to Be Better than an Aluminum Pan and a Sheet-Iron Plate for Making Hot Cakes

for hot cakes it warped diagonally across the middle, as at B. This made cooking with it very slow, and to straighten it so it would not warp seemed impossible.

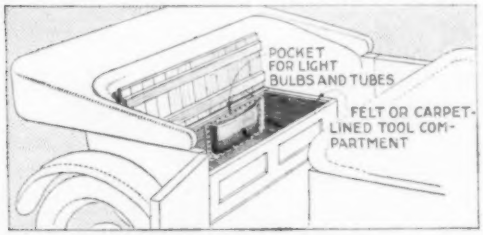
A piece of No. 20 gauge sheet iron was cut a little larger than the stove, and used as a plate. However, it warped, as at C. The hearth of a discarded wood cookstove was then used. The sides, as shown at D, were sawed off, leaving a cast-iron plate, 1/8 in. thick. The edges were filed straight and smooth and the top smoothed as much as possible. This plate did not warp and has given satisfaction, as indicated at E.—C. F. J. Charliss, Houston, Tex.

Directions Painted on Machine Save Cleaning

The floor around the spot where a lever shear was located in a sheet-metal shop, was frequently littered with cuttings. A box was provided for them, but little used. A sign "Put Cuttings in Box," painted in white letters on the lever of the machine, furnished the necessary constant reminder. Thereafter the floor was clean, and the expense of gathering up the scrap was eliminated.

Padded Compartments in Auto for Small Equipment

Tool compartments, under the seats, in automobiles are usually of rough



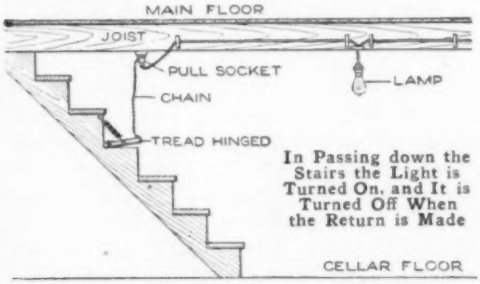
A Lining in the Tool Compartment Protects the Contents and Overcomes the Annoyance of Rattling

wood or sheet-iron construction, which exposes their contents, such as curtains, top cover, inner tubes, spark plugs, electric bulbs, tools, and other equipment, to the damaging effect of jostling over the roadways. If a lining of felt, canvas, or carpet is provided, it eliminates this to some extent, and overcomes the annoying rattle of the loose parts. It is a good plan to provide separate compartments in one side for storing inner tubes and electric bulbs.

For those who carry an emergency can of gasoline or oil, a similar covering will protect the container. A convenient foot rest is provided where the emergency can is padded, and then strongly covered.

Electric Switch Controlled by Hinged Stair Tread

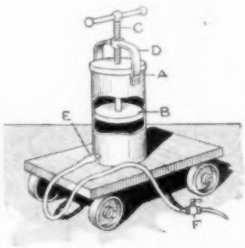
Electric lights in the cellar, or attic, are often left burning by accident, but



by arranging the light to be turned out automatically when a person leaves the place, no special attention need be given to the light. In the use of such a scheme for a cellar, as shown, a pull socket was fixed to the joist above the stairway. The socket chain was adjusted carefully and fastened to the edge of a hinged tread, kept slightly raised by a spring. Pressure on the tread controls the light socket.—Albert Bourget, Lauzon, Que., Canada.

Large Grease Gun for Garage or Shop

In a shop or garage the ordinary grease gun is often inefficient, because of its small capacity. A portable machine that I made holds 15 lb., sufficient for a large number of cars. The work is also done very quickly with the device, which is mounted on a truck. It was made as follows: An old engine cylinder, A, and piston, B, were fitted with a ¾-in. rod, 14 in. long, C, threaded as shown. A handle was fixed to it, and the yoke D, threaded to engage the rod, was bolted to the cylinder. An outlet was fitted with ½-in. hose, E, and a valve, F, with a nozzle. The nozzle should be long enough to reach the machine parts to be greased, and is made of ⅛-in. pipe. To use the gun, fill the cylinder, screw the piston down tightly and open the valve to the feed desired. —M. R. Landin, Denver, Colo.



Care of Chamois-Skin Wash Leather

So-called chamois skin, or wash leather, should be wrung out at once after using it in water. Spread the leather out carefully, and hang it up to dry. Hot water makes it harsh. Wash the leather in soapsuds, using a good white soap, and permit some of the suds to remain in it. If properly cared for, a wash leather, used considerably, is better than a new one.

The Making of an Eye Magnet

By JOHN D. ADAMS

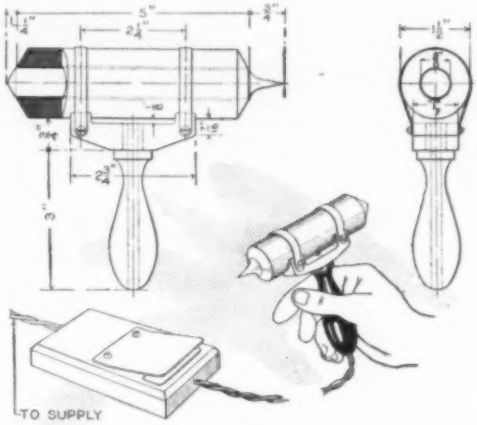
When one considers the number of accidents to the eye that occur in machine shops and factories from flying chips of iron and steel, it is remarkable that the eye-magnet method of extracting is not more commonly used. It is the purpose of this article, therefore, to describe the construction of a strong eye magnet that may be connected up directly, without any additional resistance, to the ordinary 110-volt alternating-current supply. The device may be made at a cost of about $1.50 for materials.

The sketch shows the essential dimensions. A stiff paper tube is first formed by wrapping a strip of strong paper, about 18 in. long, on a round smooth rod, about 5/8 in. in diameter.

The core is composed of soft-iron wires, neatly packed together and temporarily wrapped with wire near each end to hold them together. Dip the ends in soldering fluid and then in a small pot of melted solder, in which they should be held until the solder works well in among the wires. Before unwrapping, file off the ends, one to a dull point and the other quite sharp.

The temporary core upon which the tube was formed is then mounted on the bench in a pair of blocks, so that it may be turned readily with an improvised crank fastened on the end. The tube is then forced on tightly, after which the winding is begun. This preliminary work will save time, as it is impractical to wind wire by hand, and winding in a lathe is often unavailable for amateurs. Secure the end of the wire to the mandrel; about 1½ lb. of No. 20 wire will be necessary. Wind on the first layer tightly and shellac it. In beginning the second layer pull the wire tightly, and then wind it in the hollows of the first layer. By continuing this method the ends of the coil will build up at an angle of 60 degrees.

To mount the coil, a wooden yoke should be prepared and fitted to match the curve of the coil. In the center of this, a wooden handle, having a central hole large enough for the usual flexible cord, is fitted and glued into place. A



A Powerful Eye Magnet may be Made at a Cost of $1.50 for Materials, and Is Useful in Shops Where There Is Danger from Flying Chips

pair of brass or copper bands are fitted and drilled at each end. Run the flexible cord up through the handle and connect it to the coil, soldering the two joints, after which place the bands in position and tighten the screws.

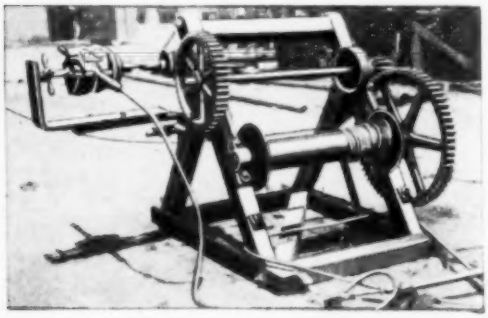
The floor switch is a block of hardwood, 1 by 3 by 4 in., hollowed out underneath. The spring is made of a wide strip of brass or heavy tin, which is screwed down at one end while the other stands about 1/8 in. above the block. The lower contact is a strip of the same metal, about 1/2 in. wide and screwed down directly below.

Angle Strengthens Loose Auto Fender

The connection between the fender and running board on an automobile became loose, and caused considerable racket, and in addition the fender became badly distorted. An angle of 1/8-in. sheet steel was riveted below the break. It served as a rigid connection, and was scarcely visible, also making possible the continued use of the old fender.

Compressed-Air Motor Drill Operates Windlass

In repairing a 500-ft. well, a portion of the casing was dropped to the bottom. Two men were required to turn



A Socket Wrench was Gripped in the Air-Motor Drill and Set on the Windlass Shaft

the crank of a windlass alternately while "fishing" operations for recovery of the section were in progress. The use of the air motor of a drill, as shown, greatly reduced the cost of labor and the time required. The air-motor drill was clamped to the windlass with U-clamps and angle irons. A socket wrench was tapered and slipped into the drill holder. The wrench was put in place over the square end of the windlass crank, operating the windlass at a moderate speed. The air motor may be used similarly for other winding or shaft-driving operations.—C. E. Eurit, Indianapolis, Ind.

Strike Board for Tamping and Crowning Roadway

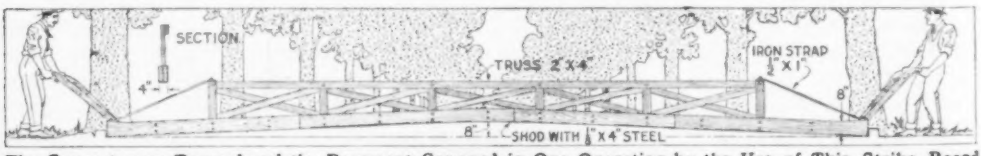
A combined template and tamper, used in the laying of a one-course concrete pavement, is shown in the illustration. The street being only 37 ft. from curb to curb, the concrete was placed across the entire width as each batch came from the mixer. The template conformed to the 8-in. crown, and was constructed of 2 by 12-in. planks, joined to make the implement the required length. Two such sections were bolted together, and the bottom shod with 1/8 by 4-in. steel. A system of trussing supports the template, and a set of plow handles is fitted at each end. This device was handled by two men throughout the entire job of 102,800 square feet.—A. C. Francis, San Diego, Calif.

Double Ventilator Hood Draws Fumes Away Quickly

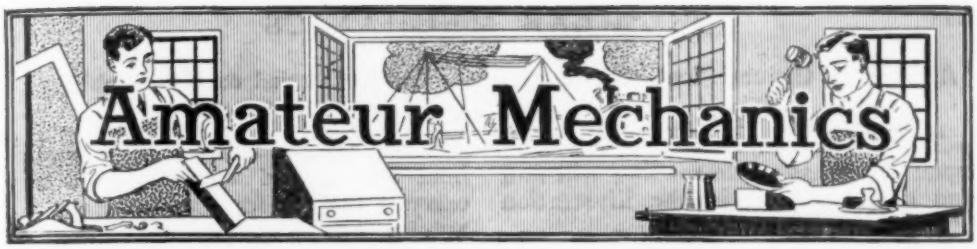
If a ventilator over a stove, furnace, or for similar uses, is made with a double hood, the fumes are drawn away more quickly because of the increased draft. The hood is formed like an inverted funnel having a smaller cone of sheet metal fitted inside of it, the lower edges of both being on a level. The inner cone has a small opening at the top, and a space of about 6 in. is allowed between the outer and inner hoods. The draft through this outer ring is considerably increased.—B. J. Ryan, Buffalo, N. Y.

Sawdust Foundation Levels Floor Linoleum

Occasionally it is desired to lay linoleum on floors, that, by the warping of the boards, have acquired ridges which would be hard on the linoleum. Instead of ruining a plane, and perhaps ruffling one's temper, by attempting to plane down a painted or hardwood surface, it is better to put about 1/2 in. of fine sawdust on the floor, leveling it off with a straightedge and laying the linoleum over it. The sawdust makes the floor level and adds to the resiliency of the linoleum.



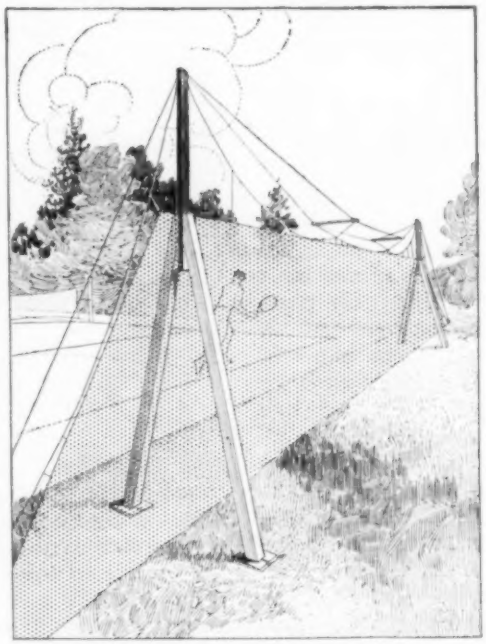
The Concrete was Tamped and the Pavement Crowned in One Operation by the Use of This Strike Board



A Knock-Down Tennis-Court Backstop

By EDWARD R. SMITH

SEVERE weather soon damages a tennis-court backstop that is built on posts set in the ground, and permitted to remain in place during the winter. The backstop shown in the illustration was designed to overcome this objection, and proved efficient on this score, as well as economical to build and maintain. Instead of setting the supports in the ground, they are set on the ground, and guyed by a system of wire braces. The wire netting is also held taut by wire braces, and the entire rigging is quickly taken down for storage, and easily set up when needed again. The lower edge of the wire is held down by hooks pinned to the ground with tent stakes, making it convenient to unhook the netting when the grass is to be cut around the backstop. The towers are 50 ft. apart, about 14 ft. high, and built up of 4 by 4-in. and 2 by 4-in. pieces of sound yellow-pine timber.



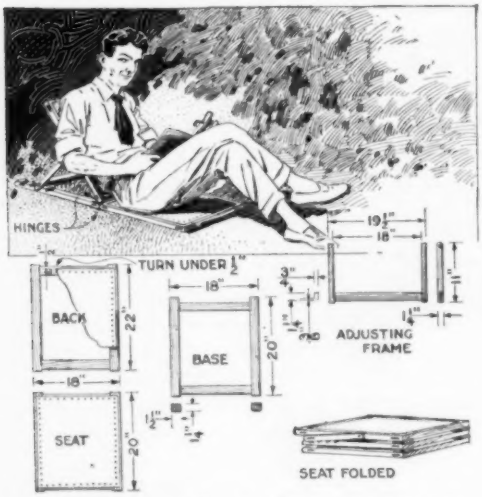
The Backstop is Taken Down between Seasons, and can be Raised Quickly by Means of the Supporting Cables

Foundations of brick, anchored into the ground, were made for the towers. End braces of heavy wire, fastened to the top, and guyed to the sunken anchors at the ground, support the towers against the weight of the netting and wire rigging. This is convenient in setting up the arrangement, as a ladder can be leaned against the end of the tower, guyed securely. To withstand side motion at the top edge of the netting, the supporting wires are carried on crossarms of 1 by 1-in. pieces of wood, 2 ft. long. This rigging is suspended between the towers and wired to the netting. When this is drawn up tightly, the netting is fairly taut. Additional supporting wires, with vertical leaders to the netting, are used to draw up the entire length of the netting tautly, as desired.

The netting extends under the towers, and is supported there by wires. As the netting extends nearly to the end guy wires, players cannot be harmed easily by running into the wires, particularly if a white flag is attached to the guy wires, about 6 ft. from the ground. Number 20 gauge wire was used for the supporting cables, and No. 9 for the end braces extending to the anchored fastenings.

A Folding Ground Seat with Back Rest

Those who enjoy sitting or lying upon the grass while reading will find the device shown in the illustration



This Seat Is Useful Out of Doors and Also for Special Purposes Indoors

convenient and comfortable. With this, one may enjoy the coolness of the ground without harm to the person or clothing. The adjustable back rest supports the body in various positions. The device is light, compact, and readily transported. It is useful also in the home and elsewhere. By placing it across the bed, or on a trunk, a good substitute for an extra chair is provided. The seat proper may be folded under and the back rest used as a prop for reading in bed.

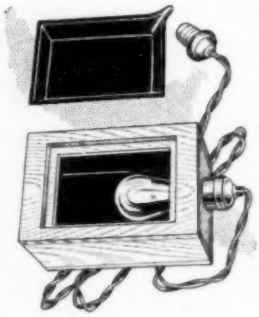
Oak is a suitable wood, and other common woods may be used. First construct, according to the dimensions given, three rectangular frames, with mortise-and-tenon joints. Cover the seat and back frames with heavy duck, turning it in ½ in. at the edges. The base is an open frame, provided with adjusting notches, spaced 2 in apart. Next make the adjusting frame, as detailed. Hinge the back and the seat to the base, and fasten the adjusting frame to the back with screws, permitting it to fold, as shown.—T. H. Linthicum, Annapolis, Md.

Bicycle Carried on Automobile as Tender

Steam yachts often carry a motorboat tender, and an automobile may carry a bicycle for emergencies. An autoist whose duties require him to travel through rural districts, had numerous unhappy experiences with a stalled car until he hit upon this scheme. The bicycle is strapped on the running board of the car, its handlebars turned flat against the side, and its wheels in tire sockets in the running board. A tank in the bicycle frame holds several gallons, and if the owner runs out of gasoline, he uses the tender to get a supply, filling the auto tank by siphoning the gasoline through a flexible tube.—John Miller Bonbright, Philadelphia, Pa.

Heater Keeps Developer at Proper Temperature

Having had trouble with developer cooling down and failing to work properly, while developing in the dark room, I constructed the apparatus shown. A small light-tight box was made slightly larger than the tray, with a removable top having an opening to hold the tray. An electric-light socket was fastened inside at one end of the box and a lamp fitted to it. A wire was attached across the middle of the lower side of the box, so that the latter and the tray could be rocked. The box was lined with black paper and varnished black. The edges of the opening in the top were fringed with felt to guard against light leakage. A thermometer is used to determine the temperature. When the developer cools, turn on the light until it reaches the required temperature.—John Hoeck, Alameda, California.

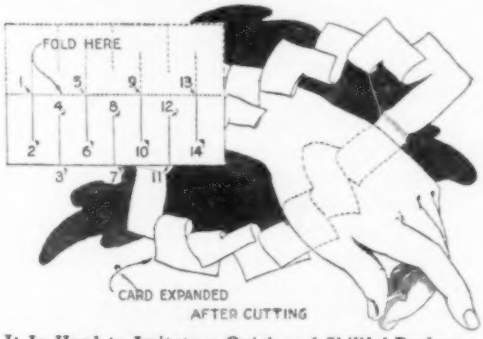


Oars Flattened to Make Rowing Easier

When rowing a small boat, we were bothered by the turning of the oars in the locks, so that the blade of the oar was not in proper position to take the water. We overcame this by planing off slightly one side of the oar, so that when this surface was against the lock, the blade was in the correct position to catch the water. It is unnecessary to grip these oars tightly, as they fall naturally into place and save the novice a great deal of trouble. In locks where this method is undesirable, the handgrips may be cut as a guide.—H. D. Burnside, Madison, Wis.

A One-Piece Bracelet Cut from a Calling Card

A trick that will amuse and interest persons both old and young can be performed with a calling card, cigarette paper, or other similar material, cut with a scissors or knife, as indicated in the diagram. The card is shown, and the performer announces that he will pass his hand through the card, making a bracelet of it. He will, of course, be challenged, and proceeds as follows: He folds the card lengthwise and cuts through two thicknesses from 1 to 2, 3 to 4, etc.; then opens the card, and cuts from 1 to 13. By stretching the paper, as shown in the

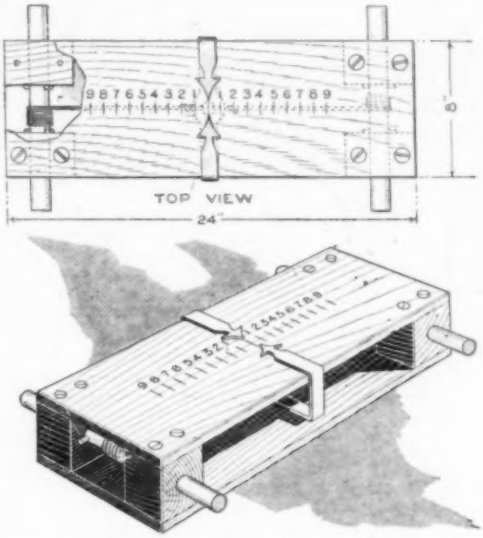


It Is Hard to Imitate a Quick and Skillful Performance of This Simple Trick

sketch, the hand may be passed through the card readily. The spectators are soon trying to duplicate the trick.—R. E. Jones, Velasco, Texas.

Device for a Finger Tug-of-War Game

Considerable pleasure and pastime was afforded by the tug-of-war game which I made. Two contestants, one



The Contestants Grasp the Rollers, One at Each End, and Attempt to Draw the Pointer Over in Their Favor

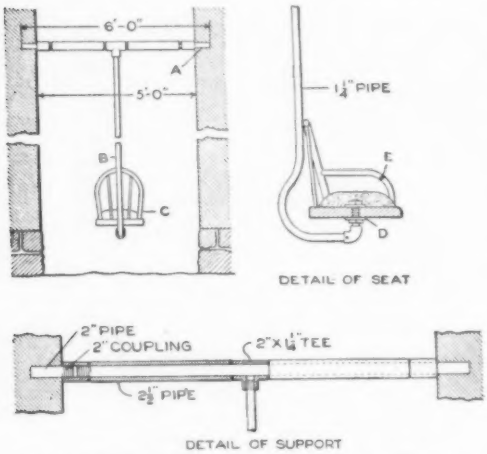
at each end, take hold of the rollers with their forefingers and thumbs and endeavor to move the pointer to their respective ends. The game interests persons of various ages, and they all want to try it.

The device should be made strongly to stand the wear on it. The top and bottom are boards, ½ by 8 by 24 in., and four blocks, 3 in. high and 2½ in. square, are fastened between them at the corners with screws. The rollers are set in the blocks, and held by small nails passing through them and set against the inner faces of the blocks. The pointer is made of a strip of brass, bent to the shape shown. Cords extend from the pointer inside of the box and are tied to the rollers.—James E. Noble, Kingston, Ontario, Can.

¶In applying a white paint over a dark, or mottled, surface, tint the first coat with a little black, making it gray; then the next coat will show solid white.

Child's Swing Built of Pipes in Narrow Space

A narrow space between two city houses was used to erect a swing, as detailed in the illustration. A piece of



This Substantial Swing Guards the Youngsters from Injury by Brushing against the Brick Walls

2-in. iron pipe, A, was cut 1 ft. longer than the space between the walls. Two pieces of 2½-in. pipe and a 2½ by 2½ by 1¼-in. tee, as shown in the detail, was slipped over the 2-in. pipe, which was built into the walls. A 1¼-in. pipe, B, 20 ft. long, bent as shown, was joined to the tee, and a seat, C, was attached. The construction of the seat is shown in detail, being fixed to the wooden part with washers, nuts, and a threaded nipple, D. A cushion and a removable safety bar, E, were also features. This swing is safer than one of rope, and will stand much greater wear.—James N. Reed, San Francisco, Calif.

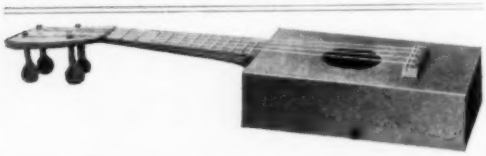
Door Bumpers Raise Height of Chair

Four wooden door bumpers, of the rubber-tipped knob type, fastened to the lower ends of the legs of one of the kitchen chairs, make an almost indispensable high chair, which will bring the table work to a more comfortable height than the ordinary chair does. The young child also will appreciate such a chair at the dining table. When it is no longer needed, the knobs can be unscrewed quickly.—J. E. McCoy, Philadelphia, Pa.

A Homemade Hawaiian Ukulele

By S. H. SAMUELS

THE one-string banjo, the cigar-box guitar, and similar vaudeville favorites are giving way to the tantalizing ukulele, and the home mechanic, to be up to date in his musical craftsmanship, must fall in line. The size of this instrument makes it especially suited to the cigar-box type of body construction, as detailed in the several

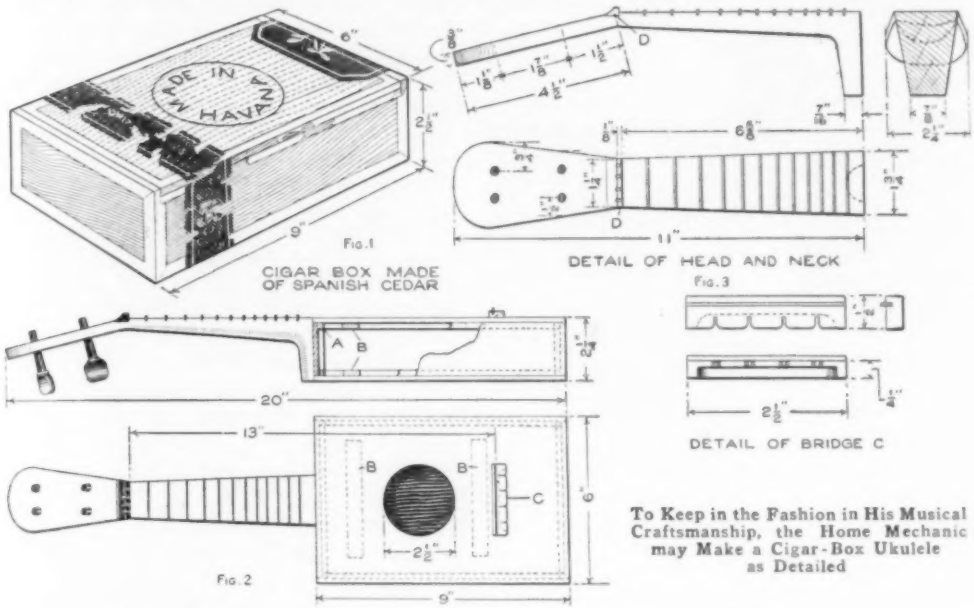


This Cigar-Box Ukulele Cost the Maker 30 Cents, and Affords Him the Pleasures of a More Expensive One

sketches and shown in the photograph reproduced. This neat ukulele was made at a cost of 30 cents, by careful selection of materials from the shop scrap stock.

A cigar box of good-quality Spanish cedar, about 2½ by 6 by 9 in., as shown in Fig. 1, is used for the body. Remove the paper carefully, so as not to mar the surface, soaking it if necessary. Take it apart, and if the nail holes are too numerous, or broken out, trim off the edges. Fit the parts of the body together, as shown in Fig. 2, the top and bottom pieces resting against the side and end pieces, and the latter between the sides. Cut the 2½-in. hole in the top piece, as shown, 3¾ in. from the neck end. To reinforce the body make strips A, ¼ in. square, and fit them to be glued into the corners at the top and bottom. Make strips B,

1/4 by 5/8 by 4 1/2 in., and glue them under the top and on the bottom as indicated in Fig. 2. The final assembling and gluing of these parts, using animal glue, should be done after the bridge C is in place, and the other parts are made. The bridge is of hard wood hollowed underneath the notched edge, as detailed, and is fitted with a metal string contact.



To Keep in the Fashion in His Musical Craftsmanship, the Home Mechanic may Make a Cigar-Box Ukulele as Detailed

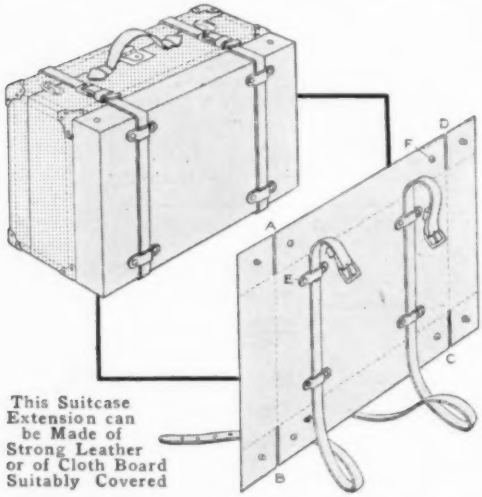
Spanish cedar or mahogany is suitable for the neck, detailed in Fig. 3. A single piece is best, but the extension for the pegs and the wider end at the body may be joined and glued to the main portion of the neck. Dowels should then be used to reinforce the joints. The outline of the parts of the neck are shown in detail in Fig. 3. In the sectional view at the right, the shape of the neck at the thinnest and thickest parts is shown by the two upper curved, dotted lines. The nut D is made of mahogany, walnut, or other hard wood, the grain extending lengthwise, and the notches for the strings spaced as shown.

The making and spacing of the frets must be done very carefully. They are of aluminum, brass and other metals being suitable also. Make the frets 1/16 by 3/16 in. and cut grooves 1/8 in. deep for them. The spacing of the frets is determined as follows, a standard practice: The distance from the metal string-contact on the bridge to the nut should be measured carefully. The first fret, near the head, is 1/18 of this distance from the nut, the total length being in this instance, 13 in. The second fret is set 1/18 the distance from the first fret to the bridge; the third, 1/18 from the second fret to the bridge, etc. The frets must fit tightly in the grooves, requiring no special fastening. The tuning pegs may be bought or made.

In assembling the parts, fasten the end of the body to the neck, with glue, reinforced by screws. Set its upper edge parallel with the fingerboard, and so that the latter is flush with the top of the body, when fitted to it. Assemble the body, without the top, gluing it to the end, fixed to the neck. When this portion is thoroughly dried, fit the top into place finally, and glue it. The whole construction is then cleaned, sandpapered, stained, and shellacked or varnished. The stringing of the instrument is simple, and the strings may be purchased in sets.

Homemade Suitcase Extension

A handy addition to the traveler's equipment is a suitcase extension that may be removed when not in use, and



This Suitcase Extension can be Made of Strong Leather or of Cloth Board Suitably Covered

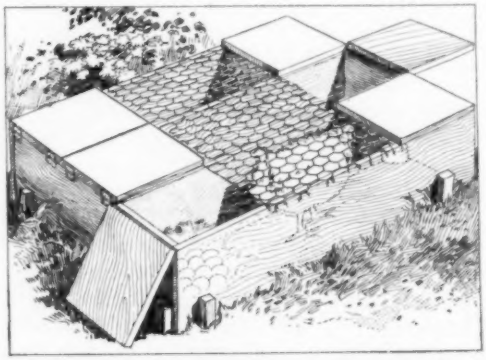
folded compactly, inside of the suitcase if desired. This latter feature is provided for by arranging the extension to be folded vertically at the middle. Heavy leather, cloth board covered with strong linen, or canvas of a suitable color may be used. If cloth board is used it should be cut the size of the side of the suitcase, and smaller sections hinged to it at the folds. The leather need not be reinforced if it is fairly strong. Cut the leather at A, B, C, and D, and arrange it to be folded on the dotted lines. Rivet guides for the straps, as at E. Fit the corners with buttons or snaps F, which are locked in position when the extension is in use. The device slides over the suitcase and may be drawn tightly against it when empty.—R. S. Matzen, Fort Collins, Colo.

Putty Deadens Glossy Surfaces in Photography

Attempts to make "close-up" photographs of machinery, or highly polished objects, often fail because the reflection of light upon the bright surfaces causes a blur in the photograph. Some photographers use putty to deaden the gloss. A lump of putty is rubbed over the surface gently where a brilliant reflection is visible, or the entire surface is rubbed so that it presents an even, dead finish on the ground glass of the camera, when focusing.—Ralph W. Tillotson, Erie, Pennsylvania.

Coop for Sitting Hens

When several hens are to hatch out settings at the same time, considerable space can be saved and much convenience afforded by making a coop as shown in the illustration. It consists of an outer frame of boards, 1 ft. wide and 6 ft. long, or as long as desired for the runway. The frame is divided into compartments by boards extending from end to end, each compartment being for one hen. The frame is placed on level ground and staked in place. At opposite ends of each compartment is a hinged cover. The intervening space is covered with wire netting, with shelter boards placed loosely over it. Under one of the hinged covers the nest should be placed on the ground, and at the opposite end food and water are provided. Each hen has plenty of space to exer-



Each Hen Has a Compartment, with Plenty of Space for Exercising

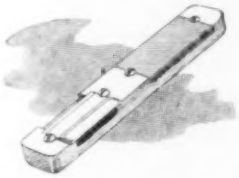
cise in, and must at least get up for food and water. The individual covers permit separate examination of the eggs, or feeding of the hens.—F. W. Buerstatte, Pullman, Wash.

Smoking of Lamp Overcome by Increasing Draft

While sitting in a room around a lamp, a group of workmen discussed the probable causes for the smoking of an oil lamp. By way of experiment, holes were punched in the perforated part of the burner, increasing the draft through the glass chimney. It was then possible to turn the light up much higher, without the usual deposit of smoke. As a result of this, several other troublesome lamps were soon remedied.—J. E. McCormack, Haliburton, Ontario, Can.

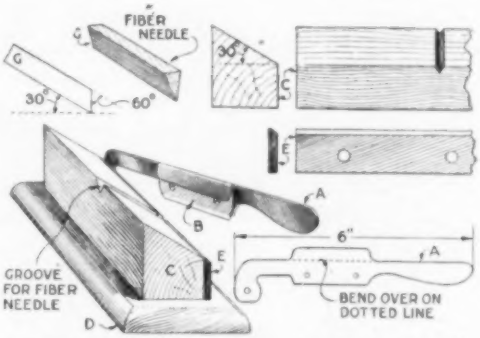
Pencil Sharpener Made of Wafer Razor Blade

This tool combines a knife and a file on one handle, of wood, 7 in. long. The knife is a single-edged safety-razor blade, clamped to the handle by two round-head screws. A space, 1/8 in. deep, under the blade is allowed for chips, and a piece of a fine file is recessed into the other end of the handle. To use this sharpener, hold it as a pocketknife is ordinarily held in whittling. The blade will keep its edge for a considerable time.—Ralph W. Hills, Madison, Wisconsin.



Device for Sharpening Fiber Phonograph Needles

A practical sharpener for fiber phonograph needles may be made as follows: A lever handle, A, is cut from heavy sheet metal. A safety-razor blade, B, is bolted to it, and the metal flap bent over as indicated. A block, C, cut so that the upper face makes an angle of 30° with the base, is faced with a metal strip, E. A triangular groove is cut or filed for the needle G. The lever is hinged, as shown, by means of a screw. A base, D, may be added. To operate the sharpener, place a needle in the groove so that a very small portion of the playing end

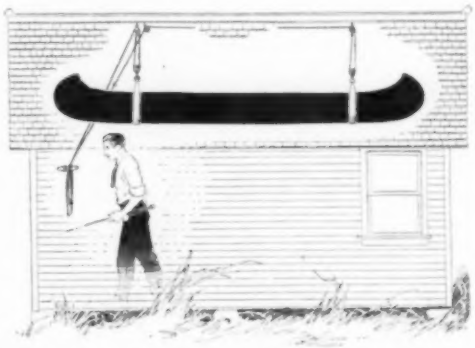


By Using This Needle-Sharpening Device the Life of Records is Prolonged

extends past the face of E, and shear off the end.—C. M. Hall, St. Louis, Missouri.

Canoe or Boat Stored in Pulley Slings

A canoe, or small boat, which is taken from the water when not in use, suffers damage if it is left unprotected in the open. A practical method of storing it so that it can be taken out quickly is to suspend it from the roof structure of a small shed, or a garage, by means of slings. The latter are made of double thicknesses of strong canvas, and are provided with rings where they join to the lower pulleys of the hoisting rope and tackle. The

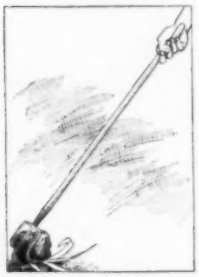


The Canoe is Stored in the Garage, and Conveniently Hoisted into the Gable

cushions, paddles, etc., may be left in the canoe.—Robert W. Jamison, Mitchell, S. D.

Clod Rake Protects Corn in Cultivating

Small corn is often injured by lumps of dirt being thrown on it when cultivating. If these are not removed the corn may grow to one side, or may lie flat on the ground. In order that I need not get off the cultivator to remove such lumps, I made a rake out of an old fork. The tines were heated and bent, as shown. An iron rod may be used for the handle, but the wooden one is light and easy to hold.

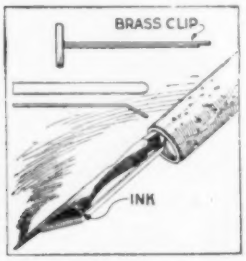


Curious Support for Call Bell

Two highly polished horns fitted into a polished wooden base and banded with silver form the support for a call bell shown in the illustration. A tapper, which rests beside the stand, was made of a deer hoof.—James M. Kane, Doylestown, Pa.

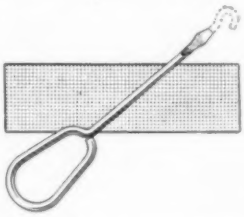
Ordinary Pen Converted into Fountain Pen

An ordinary penholder and pen point may be easily converted into a fountain pen, with the aid of a brass paper clip of the kind shown. The cap is pried off and the prongs straightened. One of the prongs is cut to suitable length, and the end bent as indicated. It is then inserted in the penholder, and adjusted to 1/8 in. from the end of the pen point. The ink is placed between the bent clip and pen point, from where it feeds evenly as needed. This kink is helpful when using the heavier drawing inks, as well as with writing inks.—R. L. Templin, Champaign, Ill.



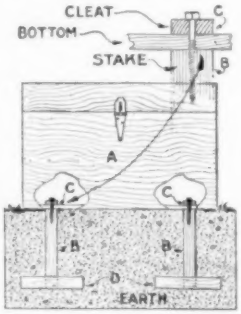
Screwdriver Made from Buttonhook

Losing a sewing-machine screwdriver, I easily made another by cutting off the hook end of a buttonhook with a chisel. The cut end was placed upon a piece of iron and, with a hammer, formed into a screwdriver in a few minutes. The rounded top of the buttonhook makes it convenient to handle or hang up.—E. M. Bierwagen, South Bend, Ind.



Guarding a Camp Chest against Theft

Unless a camp chest is secured to the ground so that it is difficult for marauders to carry it away, it cannot be left at unguarded camps without some danger of theft. By fitting the chest A over stakes, B, set into the ground with crosspieces, D, a secure fastening is provided. Cleats, C, with holes for lag screws, are fitted into the bottom of the chest, making it easy to remove the fastening when desired. The cleats are kept in the bottom of the chest when not in use.—K. A. Thompson, Lexington, Va.

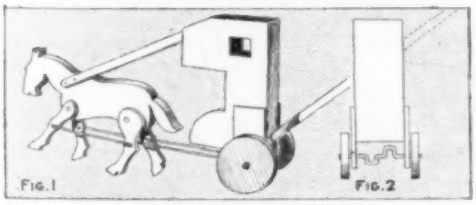


¶ By carefully piercing the small end of an eggshell with a large needle, a funnel for filling very small bottles is provided.

A Toy Horse That Walks

This toy, amusing for the youngsters, and their elders as well, will repay one for the making of it. Use a cigar box for the carriage, making it about 10 in. high, and shape it in the design shown. Nail a piece of wood, 1/8 by 2 by 4 in. wide, on each side of the carriage, and drill 1/8-in. holes in them for the axle. For the horse, take a piece of wood, 1/2 by 4 by 6 in. long, and draw an outline of the head, neck, and body. Cut this out and drill 1/8-in. holes where the legs are attached.

Cut the legs as shown, about 3 1/2 in. long. Attach them with small bolts, or rivets, allowing space to move freely. The wheels are made of pine, 1/2 in. thick and 3 in. in diameter. The axle is made of 3/16-in. wire bent to the shape indicated, 1/2 in. at each offset. Fit the wheels on the axle tightly, so as not to turn on it, the axle turning in the pieces nailed to the sides of the carriage. The horse is attached to the top of the carriage by a strip of wood. A 3-ft. wooden handle is attached to the back of carriage to guide it. Wires



The Toy is Pushed by Means of the Handle, Causing the Horse to Walk

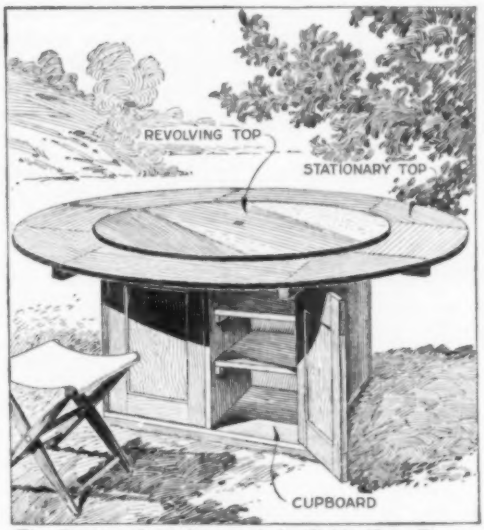
are attached to the legs, connecting with the offsets in the axle.—Charles Claude Wagner, Los Angeles, Calif.

Safeguarding Contents of Unsealed Envelopes

The gummed flaps on envelopes for first-class mail are generally short, and for sending photographs or second-class matter these short flaps do not stay tucked in. The solution is to lengthen the flap, by pasting on a sheet of paper, using the gum thereon.—G. N. Neary, New York, N. Y.

Revolving Outdoor Lunch Table

Picnic parties on one of the Maine lakes make much use of a large table, having a revolving top, so that the



The Persons Seated around the Table Help Themselves to the Food Conveniently by Turning the Central Top

lunch may be placed on the center portion and the persons seated around the board may help themselves handily. The stationary top is supported on several cross braces of 2 by 4 in. stuff, and the revolving top, pivoted at the center, is carried on wooden roller bearings, fixed near its circumference. The lower portion of the table is in the form of cupboards which are padlocked, providing storage space for equipment left for the use of picnickers. The table is set under a pergola, which provides shade. Benches, curved to fit the table, may be used conveniently with it. A small table of this type is practical as a children's play table, providing convenient storage space for toys and other articles. —E. E. Dickson, Holyoke, Mass.

¶When, in papering a bathroom with the same tiled paper on sides and ceiling, the paper does not match in the ceiling corners, place a strip of quarter-round there, and color it to suit the paper.

Window Frame and Table for Dark Room

By JOSEPH LIMBRUNNER

THE amateur photographer often has a poor dark room, sometimes made worse by the use of an evil-smelling lamp. If he wishes to use a room that has daylight, he finds it difficult to convert the room quickly for his purposes, especially if he desires to make use of the daylight for his work. Under these conditions, the arrangement described in this article was devised, and proved so satisfactory that I pass it on to the host of amateurs who find satisfaction in making part of their equipment. The table and window frame in place are shown in Fig. 1. The table is removed by withdrawing the rod, and bending up the hinged legs. The frame and window covering are removed by releasing the four small hooks. Ruby, yellow, or ground glass may be inserted in the sliding frame, as required, nearly all of the light being shut out, or light admitted without a glass, by sliding the frame.

The general arrangement of the parts is shown in Fig. 2. The dimensions are suggestive only, being suited to a small window in a bathroom, where the equipment was installed. The table is merely a board top supported by hinged legs, which are braced by a removable round wooden rod. A frame, C, as detailed in the section at A-B, Fig. 3, is fitted closely in the window casing. It is covered with heavy cardboard, tacked on. The ways J, in which the frame for the glass slides, are fixed to the lower rail of the frame C, and to a crossbar at its middle. A 5 by 7-in. opening is cut in the cardboard to admit the light, as shown in Fig. 2. Holes D are bored in the ways to receive pins which hold the frame at various positions, as indicated by the stop holes E, Fig. 4.

The sliding frame is detailed in Fig. 4. It consists of a back frame of ½-in. wood, sliding in the grooves of the ways J, and a frame of 1-in. stuff, mounted on the front of it. The openings may be made to suit the size of plate to be used, 5 by 7-in. openings being indicated. The openings are provided with rabbeted edges, as indicated by the width G, and the height H, in which frames of light weight, for the 5 by 7-in. glass plates, are

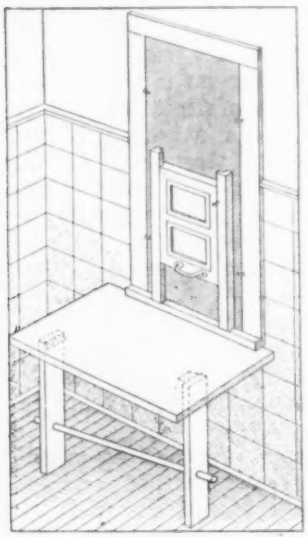


Fig. 1

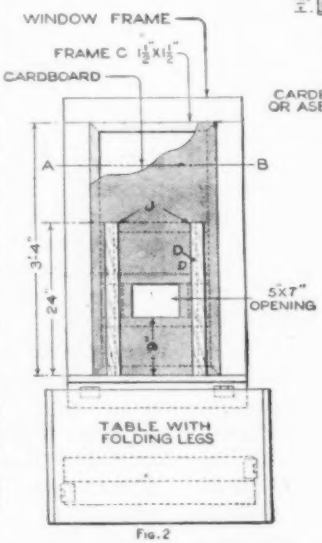
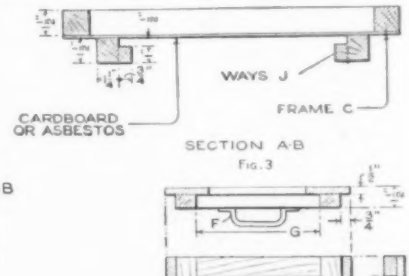
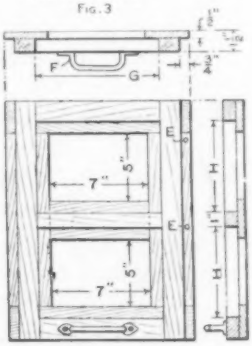


Fig. 2



SECTION A-B
Fig. 3



DETAIL OF SLIDING FRAME
Fig. 4

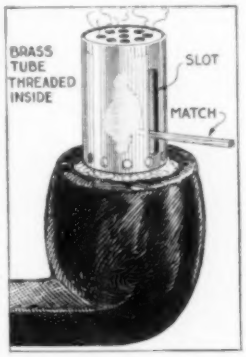
With This Sliding Frame and Folding Table, the Work of the Photographic Dark Room can be Done by Daylight in the Home Bathroom

fitted. The frames may be made, or plain, cheap picture frames may be used. The sliding frame is raised and lowered by means of the handle F. The cardboard covering the larger frame should be painted a dull black, and the wooden parts may be shellacked in the natural color.

When developing films or plates, the frames with the red and yellow glasses should be inserted in the sliding frame, and held in place by turn buttons. The red glass will ordinarily be satisfactory for developing, but on very bright days, with the sun shining directly on the glass, a layer or two of "post-office" paper is placed over it. The yellow glass may be used when fixing, and other work requiring a subdued light, but not when developing is done. For printing, put in the yellow and the ground glasses, the latter admitting sufficient light for the purpose. To use the dark room occasionally in the evening, I set a lamp on a well-protected shelf outside of the opening in the cardboard, and proceed as in the use of daylight.

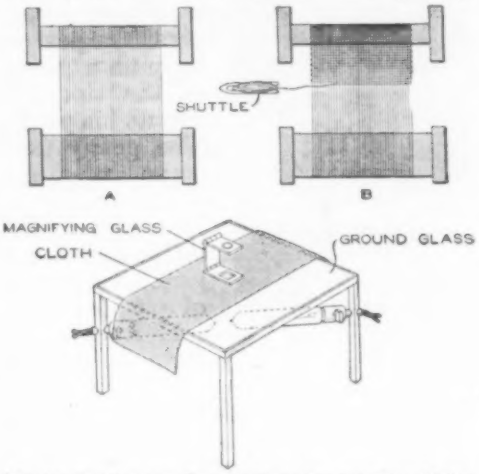
Non-Blow-Out Cigar and Pipe Lighter

"It is a poor Irishman that cannot light his pipe when the wind is blowing," but the sketch shows a device that will make a "Paddy" out of anyone, with a great saving of matches. It is made from a small piece of brass tubing, or drawn shell, ½ in. in diameter, and about 1½ in. long. The open end is placed in the bowl of the pipe or over the end of the cigar, a match inserted through the slot, and a quick stroke on the threaded portion ignites the match. The small holes provide air. The top is soldered in place.—James H. Rodgers, Montreal, Canada.



Electric Counting Glass for Thread Fabric

The intelligent housewife and shopper, as well as persons professionally interested in the structure and quality



Woven Fabrics are Examined under the Magnifying Glass and the Number of Threads to the Square Inch Counted

of woven fabrics of various kinds, can make good use of a counting glass for close examination of such material. In its simplest form the device consists of a cigar box with a ground-glass top and a small electric light inside. Where larger pieces of goods are to be examined a small table with wooden legs and wooden frame for the glass may be made.

The diagrams at A and B represent the threads making up the cloth as stretched on the rollers of a loom. The lengthwise threads, or warp, are shown at A, and the cross threads, or weft, at B. By magnifying the material with a glass exposing an area of ½ or 1 in. square, the threads may be counted or closely examined and the quality determined. This also enables one to identify goods as being the same.—F. Ball Pinkus, La Crescenta, California.

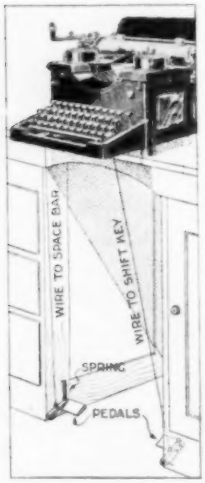
¶An inexperienced workman broke eight curved window panes on a lake steamer by attempting to cut them on the inside, instead of on the outside of the curve, in fitting the glass.

A Penny-in-the-Slot Newspaper Stand

A silent, yet very successful "newsboy" is shown in the photograph reproduced. Each rack holds one of the daily newspapers. The passer-by puts a penny in the slot and selects his paper. The penny falls down a chute, striking a bell, as evidence that the customer has paid. Hundreds of papers are sold from this rack each day without the aid of the newsboy's shouts. The slanting shelves make it unnecessary to provide weights for the papers.—M. F. Hall, St. Louis, Mo.

Pedals for Typewriter Space and Shift Keys Increase Speed

By attaching pedals to the space key and shift key I increased my typewriting speed about 20 words a minute. I made two pedals fast to the typewriter desk, as shown, then ran stiff steel wires up to the keys, connecting the latter to the wire with rubber bands. The pedals are adjusted so that a light tap operates them. If a light typewriter is used, it should be fixed to the desk. The wires can be unhooked quickly from the typewriter, and suspended on hooks under the edge of the desk.—W. J. M., Manila, P. I.



Timing Pointer on Watch Crystal

Working in a photo-print finishing plant where often several jobs need attention and accurate timing, all at the same time, I find a pointer on my watch crystal a great help. The crystal was loose enough to permit turning it. I glued a three-cornered piece of black paper to the under side of the crystal at the edge. When a batch of prints is placed in a bath, the pointer is set 15 minutes ahead of the minute hand. When the latter reaches the pointer, it reminds me to remove the prints. After placing a batch of films in the developing tank, I set the pointer ahead of the minute hand the required time for developing, placing the watch in view, to see readily when the time is up.—A. J. Viken, Waterloo, Iowa.

Portable Tent Made from an Umbrella and Paper Muslin

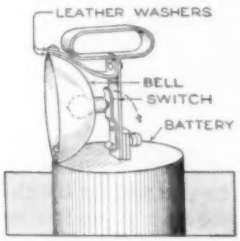
Picnickers desiring to go in bathing are often handicapped by the lack of a convenient place to change clothes. An umbrella and some paper muslin provides a light portable tent, that is practical and inexpensive for such uses. Cut the dark paper muslin into as many 9-ft. lengths as there are sections of the umbrella. Sew these strips together. At each seam tie a string about a yard long and a stout cord 15 ft. long to the handle to hold up the tent. For use, open the umbrella, invert it, and to each rib tie one of the strings. Then tie one end of the cord to the handle of the umbrella and suspend it from a tree or other support, as shown, weighting or tying down the other end.—Mabel Hubbard Birch, Cincinnati, Ohio.

Memorandum List for Camping and Outing Trips

Persons who occasionally take an outing or go camping will find a written list of articles needed on the trip a great saving of time and mental energy. This list should be made while making preparations, and again read shortly before the departure. It may be kept from year to year, and items added or withdrawn, as experience teaches. Classification is desirable, under heads such as camping gear, cooking utensils, tableware, foods, supplies, etc. Each member of a party can agree to furnish certain articles, avoiding duplication. Anyone who has gone on outings and left behind some much-needed article, will readily realize the help such a list can be, and by its use the amateur may profit from the experience of others.

A Homemade Trouble Lamp

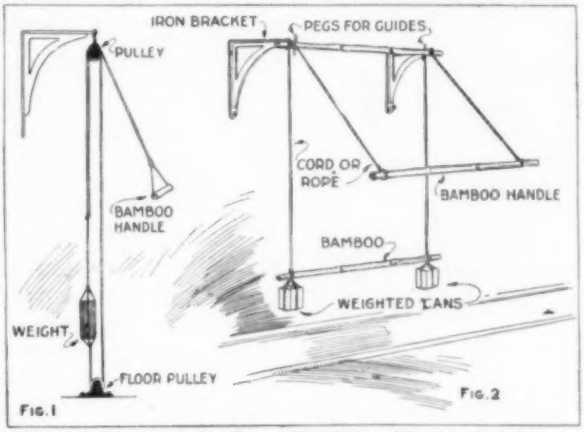
By attaching a handle for carrying, and making suitable connections, a portable trouble light was made of a dry battery. A strip of iron was bent to the shape shown, for the handle, and fixed to the binding post on the carbon. A bell from an alarm clock was drilled and tapped to fit a small light bulb, and fastened at the zinc post. The upper edge of the bell was bolted to the extension of the handle, as shown, leather washers insulating it. A small switch, riveted loosely to the iron strip, controls the light.—Carl A. Haberlein, McPherson, Kan.



¶Books to be stacked or carried should be arranged with the backs on alternate sides.

Pulley and Weight Exerciser Homemade in the Orient

Finding it difficult to obtain materials for the making of a gymnastic exerciser, I made one with makeshift parts, typical of this locality. Later I was able to get the necessary hardware and made an exerciser, as shown in Fig. 1, quite similar to those manufactured commercially. The original arrangement is shown in Fig. 2. I mounted a bamboo rod on two iron brackets fastened to the wall. Small pegs provided guides for the ropes, and the smooth surface of the bamboo caused little wear. Other bamboo rods were used for the handle and to support the weights. These were made by filling cans with sand, and tying them with cords. This arrangement was quite practical, but did not give the desired freedom of movement.—M. A. Laner, Hongkong, China.



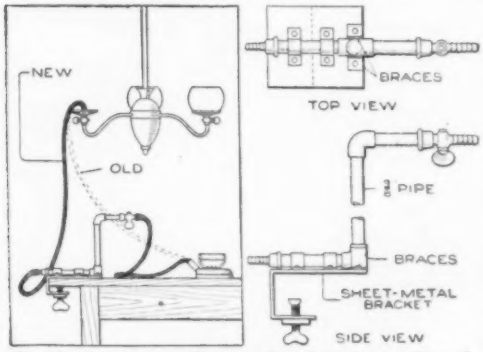
When the Necessary Hardware Was Not at Hand, a Satisfactory Rigging was Made for Exercising, by the Use of Novel Substitute Materials

Scoop on Painter's Knife Catches Scrapings

By fitting a sheet-metal scoop to a painter's putty knife or wall scraper, much of the dirt and refuse resulting is caught in the receptacle instead of falling to the floor and being tracked into other rooms. The scoop is a rectangular can, and is fastened into place by small bolts fitted through the scraper.

Gas-Hose Bracket for Ironing or Shop Use

In a home where it was customary to use an overhead gas fixture for the

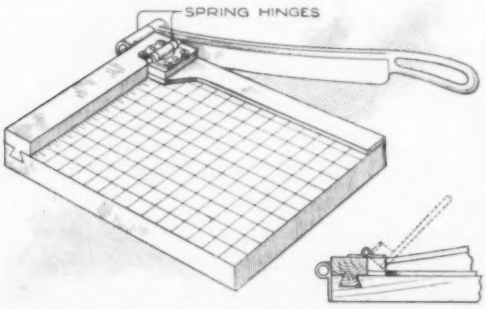


The Bracket Gives Greater Freedom in the Use of the Gas Iron

attachment of the gas iron for ironing clothes, it was found that mantles were frequently broken by the resulting jar. By making a bracket for the gas hose, which is fastened to the end of the ironing board or to the edge of the table, this trouble was remedied. The new arrangement gave much greater freedom in the use of the iron. The bracket can be removed quickly and fitted to a bench for use in the shop.—M. J. F. Schramm, Ridgewood, N. Y.

Homemade Guide for Photo and Paper Trimmer

Having an old but still serviceable photograph trimmer, with which it



The Spring Hinge Presses the Guide Down on the Print being Cut

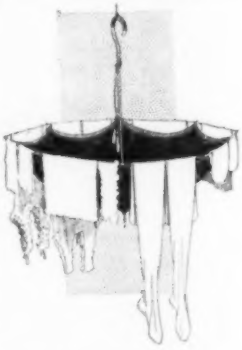
was difficult to trim prints uniformly and quickly, I made a guide for this purpose and fitted it to the board, as shown. The guide is a strip of wood, ¼ in. thick, and is fastened to the cleat with a spring hinge, mounted on a block. Although it is not transparent, like the best commercial devices of this kind, it gives good service.—R. B. Manck, Nazareth, Pa.

Joining Broken Liquid Column in Thermometer

To reunite the particles of mercury or other liquid, which have become separated in a thermometer, raise it to the level of the extended arm, the bulb outward, and jolt the tube with a quick downward stroke. Repeat this, not too vigorously, until the liquid returns to its proper position.

Umbrella Used as a Clothes Drier

A clothes drier that can be carried in a purse or a vest pocket will appeal to travelers, and persons living in small quarters. An umbrella, four yards of strong wrapping twine, and several small brass rings are required. Knot the rings into the twine at intervals, measuring the distance



between the rib points of the umbrella, and hook the twine to the points by the rings, as shown, providing considerable drying space for small articles. Hook the umbrella handle over a suitable support, or tie it carefully to the supporting pipe of a light fixture in the middle of the room, ready for the articles to be dried. The twine may also be wrapped around the points, but it is better to carry a line with rings attached.

¶By reversing the handle on a dust brush which has been worn near the point, additional wear may be obtained.

Metal Band Stiffens Brush

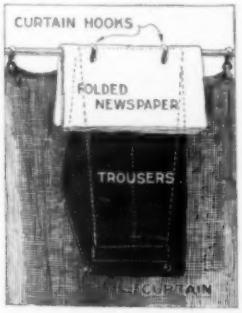
In painting, and other work where a brush is used, it is often desirable to stiffen the bristles. This may be done readily by fixing a band of sheet metal over the brush, to slide tightly. By adjusting it, the length and stiffness of the part of the bristles used may be controlled.

Rubber Band Prevents Tangling of Telephone Cord

It is exasperating to pick up the telephone receiver to answer a call and find the cord twisted or wound around the telephone standard. A long receiver cord will not tangle if a rubber band is used to support it, as shown in the sketch. The elastic permits considerable play, and if the fullest extension of the cord is desired, it may be supported on several linked rubber bands, on the left of the standard.—K. M. Coggeshall, Webster Groves, Mo.

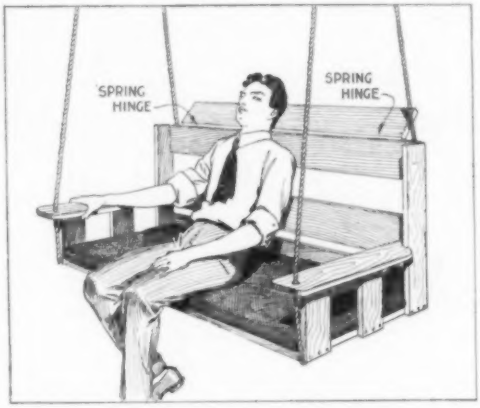
Improvised Trousers Hanger in Train Berth

The berth of a sleeping car is usually provided with a coat hanger, but if there is a rod on it for trousers, there is nothing to keep them from slipping off. By removing two of the curtain hooks, hanging the trousers over the curtain pole, and replacing the hooks over the trousers, a satisfactory hanger is obtained, which will not permit them to slip down no matter how rough the road.



Headrest for Porch Swing

Here is a "peach" of a homemade porch swing—a shock-absorbing species. The top board is attached with springy hinges, and affords an ideal headrest. It also tends to prevent children from climbing over the back.—H. W. Hart, St. Paul, Minn.



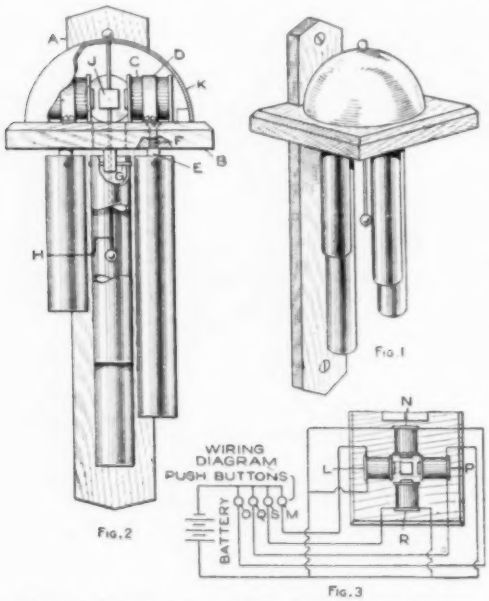
The Hinged Board Provides a Comfortable Headrest, and Is a Safety Feature

Fruit-Picking Pole with Gravity Delivery Chute

For picking fruit without bruising it, in the home garden, or for exhibition purposes, the fruit-picking pole shown in the sketch is useful. A wire ring is fixed to the top of the pole, and the bag, suspended from it, is fastened to the pole at intervals. The fruit is removed by means of the ring and drops to the bottom of the chute, which is held closed by the hand. For picking large quantities of fruit a receptacle is carried by the picker.—Mrs. Ella L. Lamb, Mason, Michigan.

A Set of Electric Chimes

A set of electric dinner chimes is a welcome and useful addition to many households, and may be made at a



When the Buttons are Pressed, Tones are Given Forth by the Electrically Operated Gongs

trifling cost by the average person handy with tools. The completed article is shown in Fig. 1, the details in Fig. 2, and the wiring diagram in Fig. 3. The woodwork is of ½-in. stock. The back A, Fig. 2, is 1½ in., by 9¾ in. long. The ends may be shaped to suit the builder's fancy. The shelf B is 4 in. square, and is fastened to the back piece 2¼ in. from the upper end. It supports the magnets C, which are made on cores, ⅜ in. in diameter and ¾ in. long, with ends 1/16 in. by 1 in. in diameter. The spools are wound full of No. 28 silk-covered copper magnet wire. These coils are mounted on the shelf by means of brass straps D. Four magnets are used, the forward one being omitted in Fig. 2.

The supports E, for the tubes, consist of ½-in. lengths of ¼-in. square brass rod. One end of the rod is drilled and tapped for an 8-32 screw which holds the support in place. Drill a small hole, ¼ in. from the end, for the pin G, made of steel wire. The tapper H is made from a 4½-in. length of stiff iron wire; 1¼ in. from one end a ⅜-in. cube of iron, J, is soldered, the wire passing through it. The ends of the wire are fitted with balls as shown. A nickeled gong, K, covers the four magnets. The end of the tapper is passed through the hole in the gong, and the ball riveted into place.

Four ¾-in. diameter tubes are used, respectively 3, 4, 5, and 6 in. long. When the apparatus is assembled as shown, and one of the magnets is energized, the latter will draw the iron cube J toward it, and the tapper will strike one of the tubes.

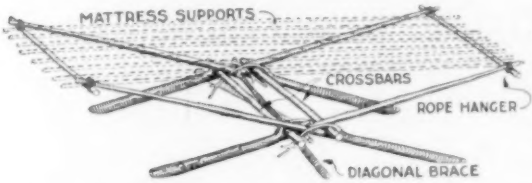
To control the current supplying the magnets, four small push buttons mounted on a wooden base are used. They are wired up with the battery and coils, as shown in Fig. 3. A wire from each of the coils runs directly to one terminal of the battery, the other wire from each coil being connected to a separate push button. The other sides of the push buttons are connected to the battery. By this means any of the magnets may be energized at will, the coils and corresponding push buttons being marked L and M, etc., alphabetically.

Tabs for Turning Sheet Music Quickly

Musicians sometimes have trouble in turning over sheet music quickly. Here is a simple way to turn the leaves quickly and easily: Paste a tab on the edge of each sheet, as shown. The first sheet is tagged at the top, the second in the middle, and the last sheet at the bottom, like a letter file. Where there are many sheets, it is easy to grasp the upper tab, on each successive sheet.—M. W. Meier, Chicago, Ill.

A Springy Hammock Support Made of Boughs

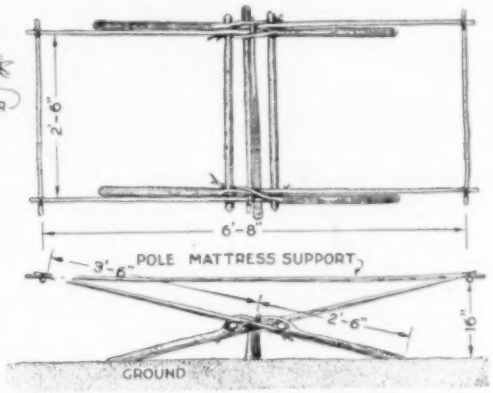
In many camping places, balsam branches, or moss, are available for



The Camp Bed can be "Knocked Down," or Transported Considerable Distances as It Stands

improvising mattresses. Used in connection with a hammock, or a bed made on the spot, such a mattress substitute provides a comfort that adds to the joys of camping. A camp hammock, or bed of this kind, is shown.

To make it, cut four 6-ft. poles, of nearly the same weight and 1 in. in diameter at the small end. These saplings should have a fork about 2½ ft. from the lower ends, as resting places for the crossbars, as shown. Then cut two poles, 2 in. in diameter and 3½ ft. long, and two smaller poles, 3 ft. long. Also cut two forked poles, 4½ ft. long, for the diagonal braces. Place two of the long poles crossing each other, as shown, 1 ft. from the ground. Set up the second pair similarly. Fix the crossbars into place, in the crotches, the ends of the crotch branches being fastened under the op-

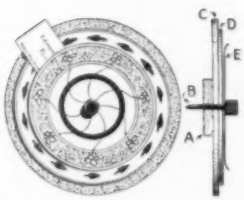


The Poles are Selected Carefully and Set Up with Stout Cross Braces at the Middle, and Lighter Ones for the Mattress Support

posite crossbar. The end bars are fixed to the crossed poles by means of short rope loops. The mattress is placed on springy poles, 7 ft. long and 2 in. apart, alternating thick and thin ends. The moss is laid over the poles, and the balsam branches spread on thickly. Blankets may be used as a cover.—J. S. Zerbe, Coytesville, N. J.

A Revolving Card, or Ticket, Holder

A holder which may be ornamented and trimmed with leather or other materials, was



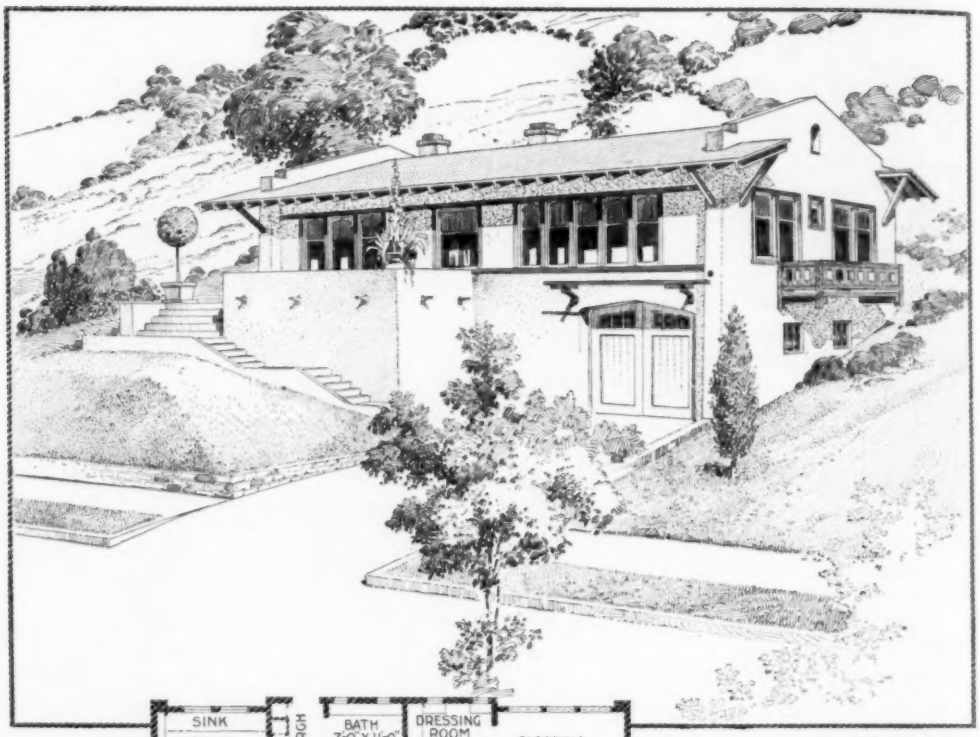
made of several disks of wood, joined at the center by a thumbscrew, and provided a neat place for calling cards, post cards, etc. The block A, which fits against the wall, is ⅜ in. thick and 2 in. in diameter. The disk C is ¼ by 7 in., the disk D, 6 in., and the metal disk E, 5 in. in diameter. The edge of the metal disk, which may be of ornamented or etched brass, or copper, is curled forward as shown. The thumbscrew B holds the disks together and fastens them to the wall.—James E. Noble, Portsmouth, Ontario, Can.

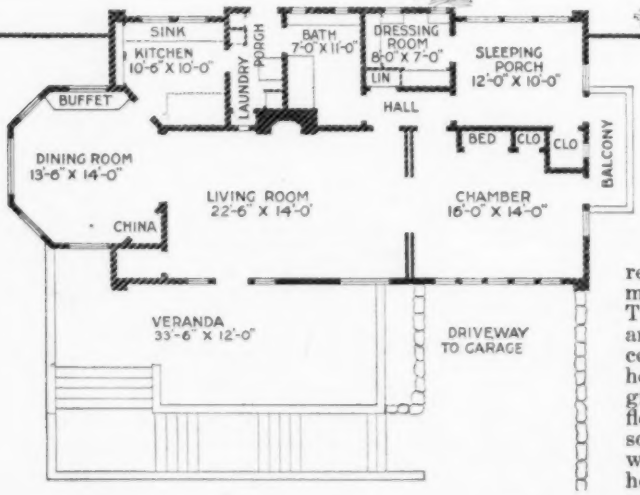
Testing Direct Current Polarity with Litmus Paper

Litmus paper laid on glass, and moistened with a weak solution of sodium sulphate can be used to test the polarity of a direct current. If the two conductors are touched on the moistened paper, the latter will turn red at the positive, and blue at the negative conductor.

¶A berry stemmer made of a small pair of tweezers is useful for removing superfluous buds from garden flowering plants.

CHARMING HILLSIDE HOUSE FOR SMALL FAMILY





P. A. NEEDHAM, ARCHITECT

IN one of the suburbs of Los Angeles there is a little residence that will undoubtedly appeal strongly to the prospective builder who has the right kind of a site for a structure of its type. It is situated on a hillside, is of distinctive, restful architecture, and is most conveniently arranged. The house was built for $3,500, an amount which included the cost of wiring, plumbing, and heating. The slope of the ground places the apartment floor high above the street level so that privacy is afforded without curtaining the windows heavily. One part of the basement is reserved for garage purposes, the entrance facing the pavement and the driveway giving access to a series of steps that extend to the broad veranda above. The exterior of the dwelling is finished in cream-colored stucco and trimmed with wood stained a rich brown. There is one large bedroom, and back of it a sleeping porch with a dressing compartment of liberal size adjacent. The toilet is easily accessible from either of these rooms. The living room is of pleasing proportions and opens onto the veranda. An octagonal form is given to the dining room.

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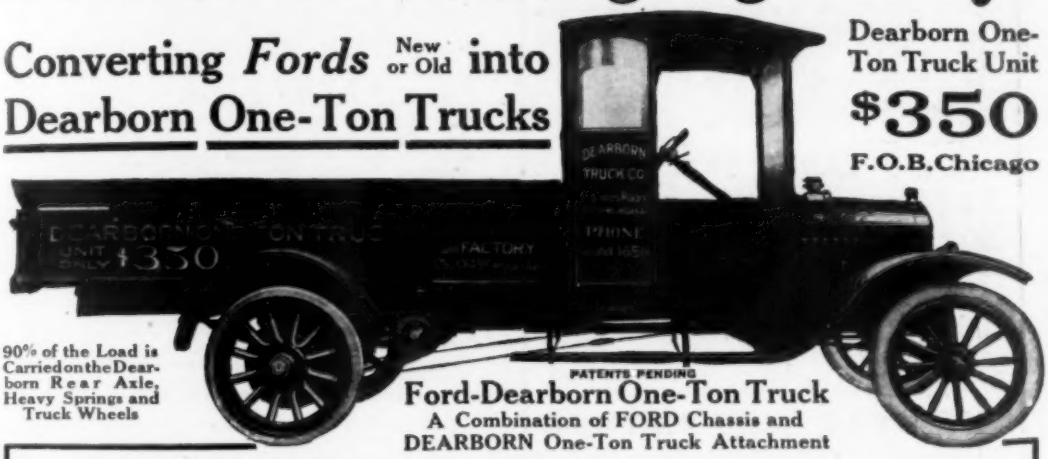

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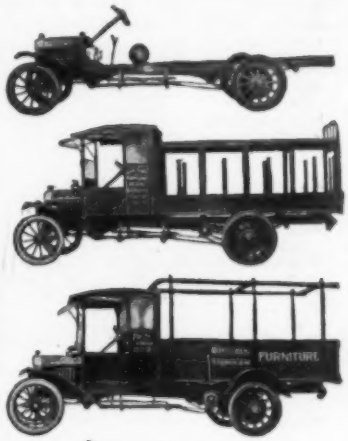

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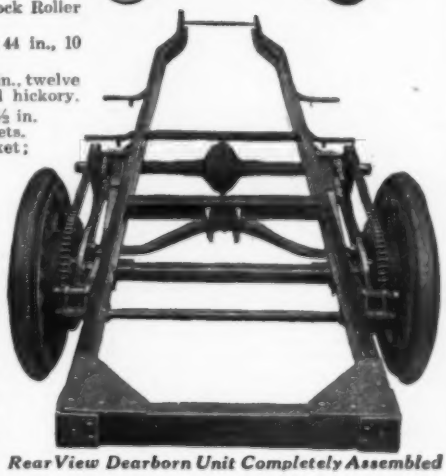

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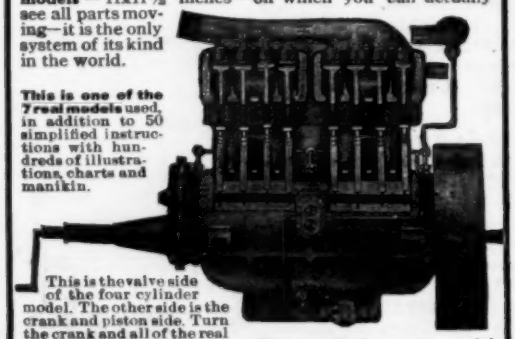

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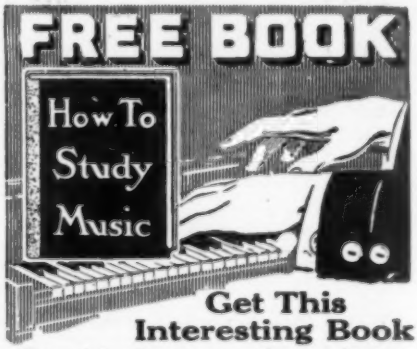

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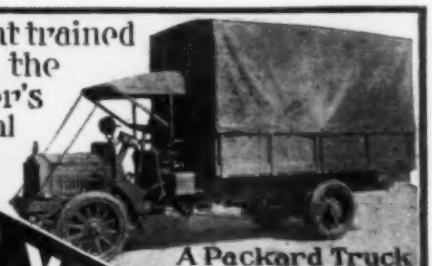

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Quartermaster Department and Signal Corps Needs Trained Men

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This is the kind of men Our Government wants and is daily enlisting. Trained men who will be efficient themselves and keep every bit of motor driven equipment in the most serviceable condition.

This branch of the Army Service pays good salaries. There are wonderful opportunities for **clean, clear headed, trained men** to advance in the service and certainly **now is the time** to train.

Aerial View of Motor Truck Group at Ft. Sam Houston, Texas. Major F. H. Pope, Cavalry, Commanding

This view gives an idea of the large number of transport trucks that will be used in our Army. Thousands of trained men are needed and will be needed to care for these machines and keep them operating up to their highest efficiency. Trained men will be given preference and men who graduate from the Michigan State Auto School are now and have been holding big, responsible jobs in Detroit and over the country and will be able to serve their country in the most efficient way.

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Motorcycle and Auto Mechanics and drivers will be needed by the Signal Corps and in every branch of the service as chauffeurs for officers' cars and as messengers. Motor Mechanics will be needed for Aeroplane work — this branch of the service is very important.

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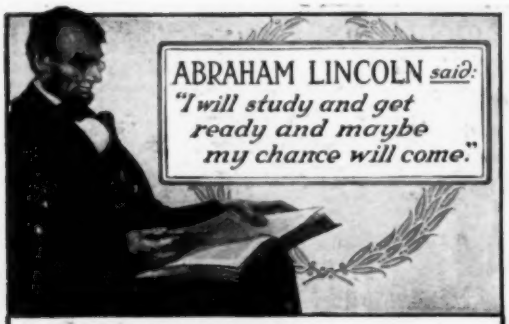

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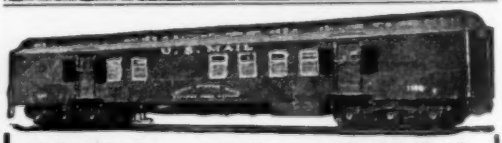

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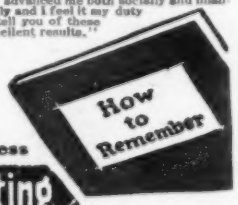

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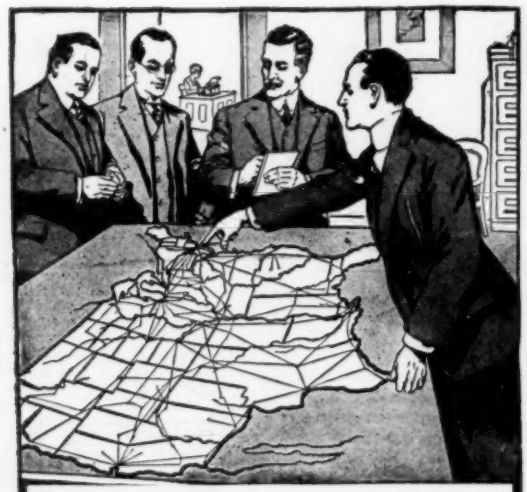

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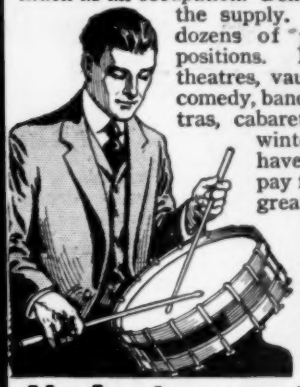

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You don't have to invest any money in instruments until you have learned to play. We teach you by mail in a few lessons at surprising low terms. Double your income, on the most popular instrument known.

Send for our free booklet. Write Now—Today.

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Write for our special offer. Become a powerful speaker in spare time by mail. Overcome "stage fright", enlarge your vocabulary, train your memory, gain self-confidence. Learn how and when to use gestures; how to suit the speech to the occasion. Increase your earning power—become more popular. We have trained hundreds of successful speakers by mail at home.

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No obligation. Write *while this offer lasts.*

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for Artists, Cartoonists and Art Students. A series of 40 9x12 technique plates. Just what you have been wanting—and the entire set, over 400 drawings, for **$3. The Students Art Magazine** publishes cash art assignments, lessons and articles on practical art and one animal plate each issue. 10 cents a copy, **$1** a year. 40 animal plates and magazine for a year, **$3.50**—SEND NOW to the editor,

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Dept. 245
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From Newsboy to Electrical Meter Engineer!

Some jump, but this is the record of Chas. King. A few years ago he was a newsboy. Now he is superintendent of instruments and meters at a large Electric Plant at a big salary. He gives full credit to our home study course for his rapid rise.

Write Today for Mr. King's own story of his success. Learn about the big jobs that are open now in this profession. **You can qualify.** No experience needed. Learn at home. Interesting, fascinating, profitable employment the year 'round. Just your name and address on a letter or postal will bring you full information **FREE.** No obligations. Write today.

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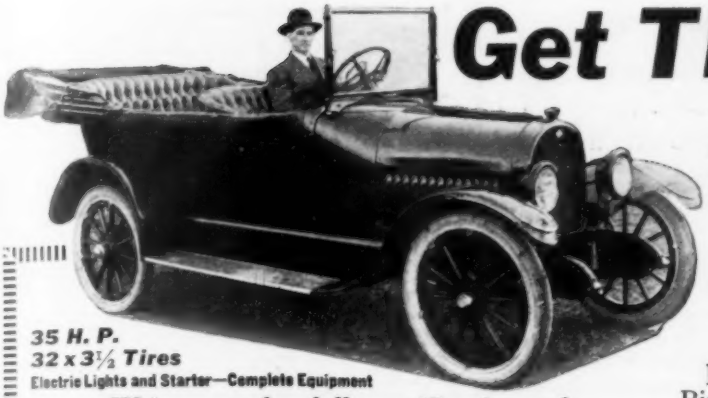
Dept. A119 Fort Wayne, Indiana



Get This Car

and

The Agency for Your Territory

35 H. P.
32 x 3½ Tires
Electric Lights and Starter—Complete Equipment

Write now for full specifications of

BIRCH SUPER-FOUR

Find out how you can get one of these superb cars for yourself and make money selling them to others. A big opportunity is open to ambitious men who are willing to train themselves and then get out and hustle. Hundreds of cars will be sold this year in every county in the United States. Millions of dollars will be paid to automobile agents. We pay big commissions for selling Birch Cars. *Send the coupon now for full information.*

Drive a new 1918 Model Birch Super-Four. Pay for it out of your commissions on sales and make good money selling Birch Cars to your friends and neighbors. Probably you know right now anywhere from six to ten people who are going to buy automobiles in the near future. Make some of these sales yourself. Get our proposition quick. *Mail the coupon.*

Here Are a Few of Our Agents—

Ask Them

John Slingerland . . Danforth, Ill.
W. C. Yount . . . Pine Bluff, Ark.
Louis H. Totterdale . Warren, Ohio
Edwin Gaertner . . Dundee, Mich.
Lafe Burleson . . Prescott, Ariz.
Neil Bland . . . . Statesboro, Ga.
J. C. Linn . . . . . Electra, Texas
H. M. Maloy . . . Mangum, Okla.
W. R. Harmon . . . Kinsley, Kan.
Mitchell & Mitchell, Hillsboro, Texas
Ernest Birch . St. Anthony, Idaho
R. B. Shealy . . . Leesville, S. C.
R. G. Moore . Mt. Vernon, Oregon
Warren A. Jones . Winchester, Ill.
Ben Doyle . . . . . Carlisle, Ky.

We can name only a few in this advertisement but will be glad to send you the names of many others as soon as you write to us. We want you to see one of our cars and ride in it if possible. When you do this we know you will be enthusiastic about the Birch and about selling the Birch cars in your locality.

What New Mexico Agent Says:

"I received my car all O. K. It's the finest looking car in the county and suits me better than any car I ever saw. Lots of men have looked at the car and they said it had the finest motor they ever saw on a car. Some have asked me if the car didn't cost $1,000 or $1,200. R. R. REAGAN, Boaz, N. M."

Birch Agents Are Making Money

One of our Texas Agents sold two carloads of Birch cars within 60 days after he received his first demonstrating car. His territory is no better than others. There is no reason why you cannot do as well. Every sale means a good big commission for you and the Birch is such a wonderful car for the money that it practically sells itself to men who know automobile values.

Whether you own a car or not, get the full details of our great offer. We have a proposition worthy of the careful consideration of every man who wants to make more money. Let you hear from you as soon as possible. *Mail the coupon in the lower right hand corner right now for big free booklet and full information.*

Be The BIRCH AGENT in Your Locality

Cash in on the demand for a strictly high-grade, light-weight, fully-equipped motor car, that exists right now in your vicinity. You have the customers. We have the cars. Let's get together. Hurry in the coupon so we can send you all the facts about this great opportunity.

PREVIOUS EXPERIENCE NOT NECESSARY

We want men of character and ability and high standing in their communities to represent us. Previous experience in the automobile business is unnecessary. **We require all our agents to take a brief but thorough course of training in Automobile Driving, Repairing, and Selling which will fit them to represent us in a manner creditable to us and profitable to them. We have trained hundreds of others for success in this way, and we believe this is one of the reasons for the splendid success which Birch Agents are enjoying.** But of course the BIG REASON is the cars themselves and the remarkable records they are making in the hands of satisfied owners all over the United States. Eighty per cent of all Birch cars are in use by farmers and in small towns, and get the hardest kind of service. Mud, sand, rocks, hills and rough going have no terrors for these sturdy cars.

Send COUPON for Big FREE BOOK and Full Information

Get all the details at once. We have agents in every state in the Union now, but we want an agent in every county. You will be astonished at the liberality of our offer. Let us put all the facts before you at once. It costs you nothing to investigate, so tear off the coupon right now. Sign it and mail it to us today. RALPH BIRCHARD, Pres.

BIRCH MOTOR CARS Dept. 619, 81 E. Madison St. CHICAGO, ILLINOIS

MEMBER CHICAGO ASSOCIATION OF COMMERCE

Sign and Mail This Coupon

MAIL THIS FREE COUPON NOW!

FREE COUPON

Ralph Birchard, Pres.
Birch Motor Cars
81 E. Madison St., Chicago
Dept. 619

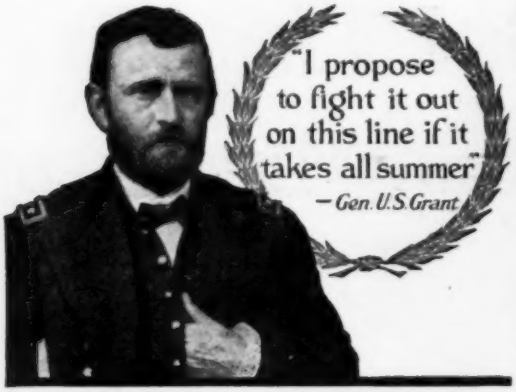
Please send me your big free booklet and full particulars as to how I can get a Birch Super-Four and the agency.

Name.....

Street No. or R. F. D.....

P. O.....State.....

Please Write Plainly



Resolve to Win!

Determination made Grant one of the greatest generals in history. The world knows his story. It knows, too, the stories of thousands of other determined men, who succeeded because they had a purpose and stuck to it.

Do you want to succeed? Do you want that better job? Do you want that increase in pay?

If you ***do*** want to get out of the rut—if you ***are*** determined to make something of yourself, send the International Correspondence Schools the attached coupon. Tell them what kind of position you want and they will show you how you can fit yourself to get it.

More than 100,000 determined men and women are getting ready for better positions right now through I. C. S. training. They are securing this training in their own homes, at small cost and without losing an hour from their everyday work.

Determine to mark and mail the coupon to-day

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5583, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark **X**.

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting
- ☐ Electric Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ Metallurgist or Prospector
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
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Name _____

Present Occupation _____

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Wonderful Watch Bargains

High grade Elgin or Waltham watches shipped for one full week's examination and approval. You wear the watch and test it out for one full week and pay only if you choose to keep it. Satisfaction guaranteed.

Wholesale Prices

We ship direct from factory to consumer, eliminating all middlemen's profits. The watch must serve as its own salesman. Our prices are so low and our terms of payment so easy that no one may be deprived of the pleasure of carrying a splendid time piece.

Write Today for Free Catalogue Sheets

We will mail our attractive and latest catalogue sheets free to all who ask for them. Write at once. A postal card will do. These catalogue sheets show the newest designs in cases and include a beautiful line of ladies' wrist watches, also the latest gentleman's military wrist watch, and a splendid line of beautiful chains. These catalogue sheets are free. Write today.

H. E. Sever & Co., 140 So. Dearborn St., Chicago

Become a MOTION PICTURE *Photographer*

War has doubled the demand for trained Camera Men. Learn in a few weeks. Salaries $40 to $150 weekly. Light, easy, fascinating employment. Travel everywhere. Day or evening classes. Actual practice in up-to-date studios under expert instructors. Call or write for booklet, free. Easy terms. Special offer to those enrolling now. Send at once.

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Cartoonists Are Well Paid

We will not give you any grand prize if you answer this ad. Nor will we claim to make you rich in a week. But if you are anxious to develop your talent with a successful cartoonist, so you can make money, send a copy of this picture, with 6c in stamps for portfolio of cartoons and sample lesson plate, and let us explain.

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Learn to be an expert wrestler. Know scientific wrestling, self-defense, and jui-jitsu. Develop a splendid physique, and have perfect health. Join this popular school and learn by mail. The famous world's champions—the marvelous

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—you should read the latest book by Orison Swett Marden, who has helped more men succeed than any other writer, living or dead. He can help you, just as he helped J. C. Penney rise from a $12.00 a week clerkship to the presidency of a $12,000,000 a year business. The new book will be sent you for 5 days on approval. Send no money. If you don't want to keep it, return it at my expense. Otherwise remit $3.00

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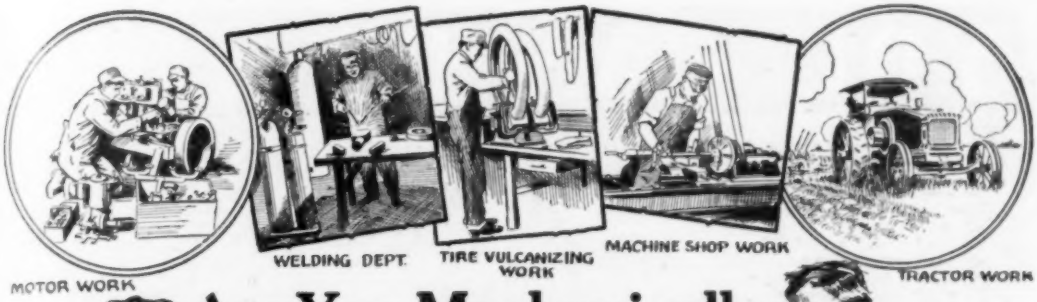

Are You Mechanically Inclined?

Get in the Automobile and Tractor Business and Grow with It!

How I Made Good

The Automobile and Tractor Business

holds more possibilities for men that are mechanically inclined, than any business in the world. It is growing faster, and it is the only business where the demand for men is greater than the supply.

Pick up any newspaper and read what the country thinks about the *scarcity* of *automobile* and *tractor mechanics.* Today men who can operate and repair tractors are in such demand that they can *command their own price,* and the usual pay is from $5 to $15 per day. Compare the amount you can earn in this business with that possible in any other.

The Sweeney System of teaching this business means giving you the **actual experience,** and these *two words* tell the story. I don't work any miracles for any one, or promise things that I cannot do, but if you will come here and apply yourself, it will be very easy for me to give you the training that will make you an expert automobile or tractor mechanic and in a position to demand the wages paid for expert service.

Experience, backed by *common sense,* is the only teacher, and it is what I use in my school. It has proven to be the right method, for my graduates are successful. We use no books, and while education is a fine thing, don't think you can't learn the automobile and tractor business without it, because you can. Ambition and determination are the things that count. I've trained thousands of men to become automobile and tractor experts by my common sense methods, and I can do the same for you.

Get in the BIG PAY and BIGGER OPPORTUNITIES BUSINESS

and grow with it. Success is easy to obtain if you make up your mind to work for it.

Write for my big, FREE catalogue

that tells the story of Success in the automobile and tractor business, and how to obtain it. Do it today, it means a new lease on life for you.

Take advantage of present conditions.

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Mail me your big, FREE catalogue.

Name .....

Address .....

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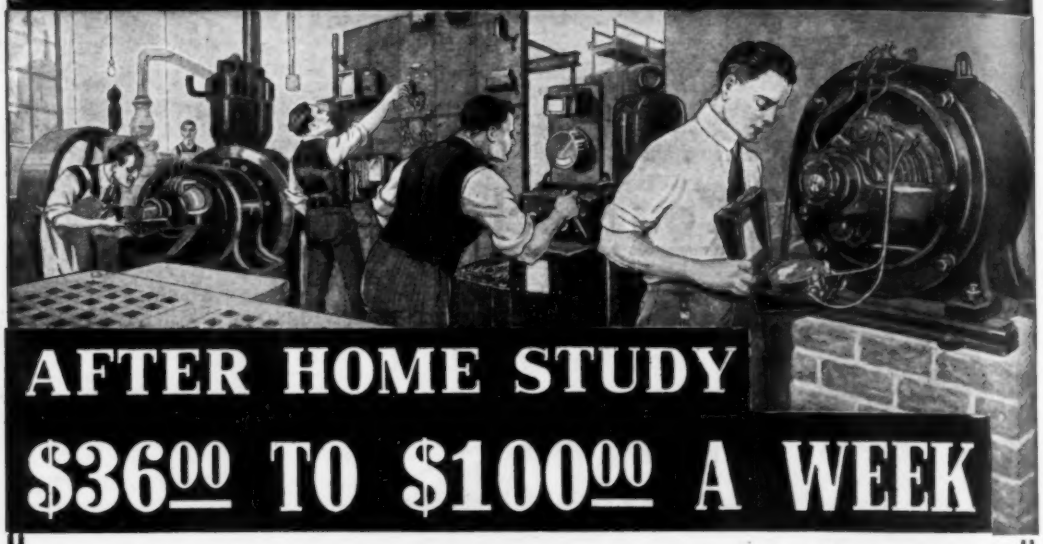
YOU CAN DO THIS



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You can earn $36 to $100 a week and more as an Expert Electrician. If you have a common school education I can train you in a few months at home. Big lighting and power companies, municipalities, and manufacturers are always seeking trained men to handle their Electrical problems.

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Every student receives our Sealed Guarantee Bond, which guarantees to return every penny of his money if he is not entirely satisfied. No other school has made this wonderful offer, but I know the success I have brought to hundreds of my students, and I know what I can do for any ambitious young man who will give me a little of his spare time each day.

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For the next 30 days I am giving each student an Outfit of Electrical Testing Instruments, Tools, Electrical materials, and Motor absolutely Free. My instruction is by practical methods and this outfit is used in working out the lessons. Practical training with the theory makes perfect. I am Chief Engineer of the Chicago Engineering Works, and I can give you the training that will land the big jobs and hold them.

If you are in real earnest I want to send you my new Book—"How to Become an Electrical Expert." It's free. No matter how many other schools you write to I want you to have my book —It's different because it's practical—Write today.

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USE THIS FREE "OUTFIT" COUPON

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Without obligation on my part kindly send at once, fully prepaid, particulars of your complete Practical Home Study Course in Electricity.

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Address .....

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We have records to prove that a classified ad in these columns will find a buyer for almost anything which can be sold. Doubtless you have some article of value to some one else which you no longer need. Why not turn it into money?

Advertisements in this section, 18 cents per word, each insertion, minimum 10 words, payable in advance. To insure ads being inserted under proper classified head in the July issue, copy must reach this office not later than May 31st.

Popular Mechanics Magazine, Chicago, Illinois.

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PAINT your own car for $5. With Autonamel you can do the work as perfectly as a skilled workman with common paint. Autonamel is not a paint—it is a new chemical discovery. It lays as smooth and lustrous with one coat as a shop-painted car with several coats. $5 outfit paints car. Send for Booklet "B" and color card showing black and eight colors. Autonamel Company, Rochester, N. Y.

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TIRES—Double Tread Guaranteed for good service. Absolutely Puncture-Proof. Big—Strong—Extra heavy, 30x3 tire, $5.00; 30x3½, $6.00; 33x4, $9.00; 34x4, $9.25; 36x4½, $12.00; 37x5, $13.00. Big saving on other sizes and tubes also. Trade in your old tires. Discount to dealers. 10% deposit required on C. O. D. orders. Send for list now! State size and bead of tire. Max Liben & Co., 205B West 48th Street, New York.

GET into biggest money-making end automobile business—replacing necessary equipment. Live, ambitious men wanted as special factory representatives, exclusive territory, taking orders for tops, top coverings, seat covers, "Stik-Tite" Windows. No experience necessary. No capital required. No competition. Copyrighted system protects you. Free catalog, samples, full details. Cincinnati Auto Specialty Company, Dept. MA-67, Cincinnati, Ohio.

BANKRUPT Stock less than half of cost. 2 Three-Ton Radiators, $25.00 each; 2 Air-Cooling Engines, $25.00 each; 5 Ross Steering Gears, $15.00 each; 5 18" Mah. Steering Wheels, 65c each; 13 Gas Tanks, 16½" x9"x33", $2.50 each; 2 Rear Axles, $3.50 each; 11 24" Break Bands, $1.00 each; Roller-Bearing Pins; Steel Washer Rings; Shifting Connections and Pins. F. O. B. Milwaukee; all goods are new; made mainly for one-ton Trucks. J. E. Rilling & Company, Milwaukee, Wis.

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BATTERY chargers earn big profits. Engine or city current operates. Electrical knowledge unnecessary. $15 places money-maker in your Garage, balance easy terms. Hobarts, Box JC, Troy, Ohio.

ONE Oil Company purchased 100 gross "Gldz"; there's a reason. "Gldz" eliminates carbon, takes the hump out of hills, and knock out of engines. One Dollar Can convinces. Only one Dealer Wanted each locality, free advertising proposition, net you $12. "Gldz," Galesburg, Illinois.

SAVE 50% to 70% on your next tire purchase. Our tires are practically blow-out and puncture-proof. Guaranteed for 3,500 miles. Send for illustrated catalog No. 4 and Price List. Tuxedo Auto Tire Exchange, 306 W. 54th St., New York City.

REAL Vulcanizer and a'x Patches sent postpaid for $1.25. Worth $2.00. Elfert Rubber Company, 1307 Sutter, San Francisco.

MANUFACTURER desires state, local and Canadian agents. Fast selling auto necessity. Schulz Mfg Co., 1105 Fort Dearborn Bldg., Chicago.

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SHINES in the dark. Our Luminous Paint, coated on any article, makes them visible at night. Watches, clocks, electric switch plates, crucifixes, match boxes, etc., can be coated with splendid results. (Everlasting.) Only 25c bottle. Luminous Paint Co., Douglas Park Station, B-14, Chicago, Ill.

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INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years' practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

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ARTICLE wanted for Mail Order business. L. C., 45 Grant Ave., Medford, Mass.

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INCREASE your sales. Place your proposition before the readers of "Cartoons Magazine," 20,000 copies guaranteed every month. Classified rate 5c per word. Mail in a trial ad today. Cartoons Classified Dept., 78 E. Madison St., Chicago.

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BOOST Your Business. 25 Model Grocery Advertisements prepaid only $1.00. 12 Clothing Ads, 50c. Written by experts. Other series for other lines. Write Ira Crawford, Business Builder, Box 128, Duluth, Minn.

20-WORD Advertisement in 120 monthlies $1.00. Continent Exchange, Hollywood, California.

ADVERTISERS—Here's your opportunity. Your proposition placed before the readers of "Cartoons Magazine" for only 5c per word. Circulation 20,000 copies guaranteed. Send a trial ad for our next issue. Cartoons Classified Dept., 6 N. Michigan Ave., Chicago, Ill.

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ADVERTISING Expert prepares pulling, profit-producing sales letters, folders, prospectuses; mail-order campaigns. Efficient, economical business-builders. Counsel free. Harry A. Stern, 1060 Gaylord, Denver.

ADVERTISING Pencils. Stamp brings samples. Graybille & Co., Lancaster, Pa.

BUSINESS SERVICE

INCORPORATE. Our lawyers do the work, saving you time, annoyance and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southwestern Securities & Investment Co., Box D488, Phoenix, Ariz.

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DEBTS Collected Anywhere, Quickly! Established 25 years. William H. Dodd, 87 Nassau Street, New York.

AGENTS WANTED

AGENTS: Biggest moneymaker ever put on the market, "Eggette," the original egg substitute. Takes place of eggs in baking and cooking at less than ten cents per dozen. Sells rapidly to homes, stores, bakers, etc. A Guaranteed pure food product. Good opportunity to build permanent business with big income. No competition. Regular size package 10c, equivalent to 12 eggs. Attractive moneymaking proposition free. Write quick. Bestever Products Co., B-1, Douglas Park Station, Chicago.

MARVELOUS Expanding Cuff Buttons, Presto, slip your cuffs up on forearm without unbuttoning same. Cuffs positively stay where placed. Lowered they close automatically. Great Laundry saver. Indespensable for all latest styles of shirts. A guaranteed necessity that appeals to all. Worn and approved by over 50,000 satisfied users. Sensational seller. Large profit and fine mail-order article; also 50 other high-class agent's specialties. Flexo Mfg. Corporation, Sheboygan, Wisconsin.

AGENTS—Wanted to handle Bonanza Sales Boards. Can be used for any purpose desired. Latest Sensation in Specialties for Sales Boards. Write for particulars. Gordon Specialty Agency, Dept. B, 52 West Chippewa, Buffalo, N. Y.

WORLD'S Fastest selling auto accessory. County distributors wanted. Good profits. Write today. G. L. W. Spring Oiler Co., San Diego, Calif.

SELLS like hot cakes. Brand new ironing wax. Perfumes clothes with lasting violet perfume. Working outfit, 5c. Perfume Gloss, 13 Water Street, New York.

$61.50 WEEKLY, introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Samples free. Luther Manufacturing Co., Dept. 310, Cincinnati, Ohio.

"WASHWHITE" makes easy sales. Big profit. Sure repeat business. Genuine Rogers Silverware free to your customers, and valuable Premiums for you. Free printed matter and Sales Course. Free samples with every order. Cleans clothes without rubbing, and without injury to the finest fabric. 7 big washings for 15 cents. Sales Guaranteed. Write for Our Offer. The Nacma Co., Dept. K-7, 20 W. Lake St., Chicago.

GENERAL Agents — Crew Managers — Capable of earning $75 or more weekly. Sell new Guaranteed home specialty backed by $200,000 corporation. Big profit. Quick sales. Exclusive Territory. Sales Manager, Dept. K-8, 20 W. Lake St., Chicago, Ill.

AGENTS—Telephone appliance. The only instrument not an attachment. Approved by telephone companies. Big seller. Sensation of last business exposition. Write now for selling right! Weilsphone, Inc., 1 Madison Avenue, New York City.

$90 PER week. Abbott makes it. You can too, selling our guaranteed Auto Shock Absorber. New principle. Better and cheaper than others. Write for territory. Act quick. Kux Rebound Check Co., Chicago.

SENSATIONAL Seller. Most remarkable discovery of science. Sanitary bed-bug eliminator. Keeps bugs away while you sleep. Sample 25c. Agents wanted. Dewlide Chemical Co., Sheboygan, Wis.

MEN or women for small quick selling article. 2 to 4 to a customer. Send 15c for sample. A customer in most every house. T. E. Gahan, 36 Western Ave., Toledo, O.

"1916's SENSATION!" Eleven piece toilet article set selling like blazes at $1.00 with $1.00 carving set Free! Enormous profits! Tremendous hit! Engle made $51.00 first week. Write quick! Pierce Co., Dept. P, 906 Lake St., Chicago.

AGENTS financially responsible who understand heating plants to sell Blaske Fuel Saving Devices on monthly payment plan. Every heating plant a prospect. Guranteed to save 20%. Evaporation tests at two universities averaged 25% saving. Wolff Fuel Saver Company, 14 East Jackson, Chicago.

AGENTS: New invention prevents loss of hat pins. Whirlwind seller. Untouched field. Enormous profits. Goods sent prepaid. Loss Preventing Device Co., Div. A, Gardena, Calif.

SOFT Drinks in Powder. Just add water — delicious, refreshing, healthful. Everyone buys—big profits. Enough for 10 glasses Orangeade and particulars 10c postpaid. Chas. S. Morrissey Co., 4417 Madison St., Chicago, Ill.

AGENTS: Make real money this year; not "paper money." Just think! Our Eradium (luminous) Articles Shine in the Dark. We manufacture a complete line so that every call can be turned into a sale. Everyone amazed at the wonderful possibilities of these goods. Our Eradium Bulb is easily attached to any light and "Locates Your Light in a Jiffy" in the darkest room. Our Eradium Crucifix showing the Christ figure in startling outline thruout the night sells to every Catholic. Our Eradium House Numbers (just out) are selling like Ford automobiles. Our Eradium Clock tells the time in the dark. Our Eradium Match Box sells like hot cakes everywhere. Garages, homes, etc. Our Eradium Switch Plate for hotels is a big seller. Write today for best proposition you ever heard of. Sole manufacturers. The Pioneer Corporation, 1259 West 63rd, Chicago.

TAILORING Agents Wanted—Big complete sample outfit and case, nearly 200 large cloth samples, 3 piece lists and everything needed for canvassing or use in store, free to live agents. $25.00 to $50.00 a week; may make more. Write us today for free elegant outfit to begin, cloth samples, wholesale prices, special offer on a suit for yourself and full information—see our wonderful values, beautiful fabrics and styles. Established 28 years. Every garment made to measure—everything guaranteed and express prepaid. Just send a postal. American Woolen Mills Co., Dept. 614, Chicago.

AGENTS: Big profits selling our New $2.50 Automatic adding machine. Quick sales. Ten a day easy. No competition. Anyone having adding to do is positive customer. You'll be glad you wrote us. Bassett Company, 5821 Indiana Ave., Chicago.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P, Cincinnati, O.

BIG Profits for You! Manufacture Barley Crisp. New Confection, 5c package costs you 1c. Machine instructions complete $7.50 prepaid. Send 10c for samples. Barley Crisp Co., 1205 Broadway, San Francisco.

GET Davis' Latest Proposition. $15.00 daily a cinch. No matter how many times you have answered my ads in last 20 years, write again. E. M. Davis, Dept. 506, 909 Lake, Chicago.

AGENTS—Line up for big profits this year. Hot string of brand-new, exclusive sellers with the big "punch" just being brought out. Grab your territory now. You'll regret it if you delay. Adam Fisher Mfg. Co., Agency Dept., 2061 Railway Exchange, St. Louis, U. S. A.

MEDALLIONS—300% profits. Make up your own goods and be independent. Catalogue free. Resag Co., 1235 Randolph St., Chicago.

AGENTS—Our gold window letter proposition beats 'em all. Stalbrite Co., Dept. P, 1115 Second Ave., N. Y. Established 1905.

AGENTS—Establish yourself in a permanent well-paying business. Automobile owners everywhere have been looking for this article. Newman's Nu-Mend positively seals punctures automatically as fast as they occur. Guaranteed. Large profits. Write for agency. Newman Mfg., Co. (Estab. 1882), 713 Sycamore Street, Cincinnati, Ohio.

AGENTS: Sell "Motorpep," New Gasoline Saver. 100% profit. Write for particulars. Universal Supply Co., Box 194, Sidney, Ohio.

AGENTS make 500% profit handling Auto Monograms, Patriotic Pictures, Flag Novelties, Window Letters and Changeable Signs. Catalog free. Hinton Co., 6142 40th Court, Chicago, Ill.

AGENTS, General Agents, District Managers: Economic gas burner saves ½ gas on gas ranges. Entirely new, just out. 133% profit. Exclusive territory. Apply immediately. Sample 25c. Phillip Sills, 212 Drake Bldg., Oneida, N. Y.

YOUR Name brings a copy of Money-Making Ideas. The great 32-page agent's and mail dealer's magazine. A Kraus, Kraus Bldg., Milwaukee, Wis.

NEW Knife Sharpener puts razor edge on any knife instantly without grinding. Demonstration creates sensation. 30 sales a day easy. Carry right in pocket. 100 per cent profit. Write for free sample offer now. American Products Co., 8639 Central Ave., Cincinnati, O.

AGENTS: Big Hit: Our 5-Piece Aluminum Set is all the rage. Cheaper than Enamel Ware. Sells like wildfire. Guaranteed 20 years. Retail value $5.00. You sell to housewives for only $1.98. Biggest seller of the age, 9 sure sales out of every 10 shown. Others cleaning up $10.00 to $20.00 a day. Answer this quick to secure your territory. Div. GG5, American Aluminum Mfg. Co., Lemont, Ill.

SEND dime for fifty square inches of America's best agent's product. Money back guarantee. The American Mfg. & Sale Co., 210 Suffern Bldg., Decatur, Ill.

AGENTS: Sell Dryola—Chemically Dry Cleans all Fabrics without water. Non-injurious. Big seller. Big profits. Particulars and sample free. Send postal today. Arehart Drug Co., Rosholt, So. Dak.

AGENTS wanted to sell automobile accessory. Can earn five dollars or more a day according to their ability. Write for particulars. Rand Manufacturing Co., Inc., Haverhill, Mass., Dept. A.

OUR Representatives—either sex—easily earn $200 monthly introducing new marvelous vacuum Butter Maker. Guaranteed. Retails $1.50. Sample free. United Sales Co., Springfield, Ohio.

AGENTS Wanted—Toliver Puncture-Proof Inner Tubes sell easily—our Agents make $5.00 to $50.00 a day net profit—no competition. If you wish to establish a business of your own with unlimited possibilities for profit, write us for complete details. Toliver Tube & Tire Co., 523-C Foster Bldg., Denver, Colo.

A WONDERFUL new invention; sure sales; big profits everywhere. Safety Specialty Co., Detroit, Mich.

AGENTS, I want 100 men to act as my agents and take orders for "Kantleak" Raincoats. I paid Eli Bridge $88.95 for one week's spare time. Cooper $314 last month. Wonderful values. A dandy coat for $3.98. No money required. No delivering or collecting. Sample coat and complete outfit all Free. Big season just starting. There's a thousand dollars in this for you if you grab it quick. Write now. Comer Mfg. Co., 129 Paige St., Dayton, Ohio.

AGENTS make 500 per cent profit selling our Auto Monograms and Initials. Window Sign Letters, Changeable Signs, and Show Cards. 4,000 Varieties. Enormous Demand. Sullivan Co., 1123 Van Buren St., Chicago, Ill.

AGENTS—Men and women. Make $30 to $50 weekly selling the New Improved Monitor Self-Heating Iron—the "World's Best." Over 850,000 in use. Positively the easiest, fastest selling, lowest priced, best known iron made. Binding guarantee. Big profits for all or part time. Evans, N. Car., sold two dozen on Saturday. Mrs. Nixon, Vt., sold eight first half day. Liberal terms. Exclusive territory. Sample outfit free to workers. Write today. The Monitor Sad Iron Co., 836 Wayne St., Big Prairie, Ohio.

AGENTS—Send for sample "Fretnot"—the wash day wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory granted to agents who can produce. Credit given. Don't call. P. M. Motter & Sons, 3213 Warren Ave., Chicago.

OVDE Fish Bait. Harmless, lawful, effective for all species of fish. 20 years on market. Great summer seller for Agents. Sample 25c. Hayes Mfg. Co., 326 River, Chicago.

AGENTS — Transparent Flags, attached like postal stamps, two sizes; for window panes, automobile headlights. Fast seller. Send 20c for set of samples. J. C. Tutt, Manufacturer, Sibley Building, 1214 Filbert, Philadelphia, Pa.

SELL guaranteed made to measure raincoats. Agent's price $2.50 delivered. Material, workmanship incomparable. Outfit free. Standard Raincoat Co., 395 Broadway, New York.

INVENT something; your ideas may bring wealth. Free book tells what to invent and how to obtain a patent, through our credit system. Talbert & Parker, 4663 Talbert Bldg., Washington, D. C.

AGENTS—We ship on consignment. Pay us when you collect. Great selling plan. Evans Solvent Carbon Remover is such a whirlwind seller people quitting jobs in factories, offices, etc., to sell it. Sold under money-back guarantee. Write today. Evans Mfg. Co., 622 E. 63rd St., Chicago.

AGENTS: You can make big money taking orders for our fine made-to-measure clothes, so write quick for 60 beautiful cloth samples. 32 smart styles in rich colors, wholesale and retail price lists, lowest prices and best offer to agents. $5.00 to $10.00 a day easy. Big outfit, over 250 samples free to live wires. No experience needed—no capital. We furnish everything free—pay postage or express charges—back you, boost you, show you how and clearly explain everything. Costs nothing to try. Let us make you a stylish suit to measure to prove our fine quality and style. Send postal or letter today. Paragon Tailoring Co., Dept. 614, Chicago.

SAY! If You Only Knew How Easy It is to Make the Big Selling Specialties you sell by Miller's Guaranteed Formulas,—You'd Get Busy—Make Wizard Washing Tablets—No Wax, Potash or Lye—costs 5c pound, bring sixty. Egg-o-lene, only real egg substitute—represent eggs nine cents dozen. Putnam's Dry Cleaner, Non-Alcoholic Tube Flavors—Dessert Powders—Zeerosalz—preserves eggs indefinitely. Carbo-Cide Guaranteed Gasolene Intensifier—Decarbonizer—Fibro-Vac Automatic Fibrous Puncture Plugger. Send Stamp Today for Latest Lists and Money-making Propositions. Miller, Analytical Chemist, Tampa, Florida.

RELIABLE People Wanted to Place Our Orangeade Powder in stores and appoint agents. Makes the most delicious drink you ever tasted by just adding cold water and sugar. Enough for 10 glasses and particulars 10c postpaid. Chas. A. Morrissey Co., 4417 Madison St., Chicago, Ill.

THE Peoria Starter for Ford Cars. Practical, durable and guaranteed. The best mechanical Starter on the market. Some territory still open. Money maker for hustlers. Write for particulars and territory. The United Co., Peoria, Illinois.

SHOW public how to cut high cost of living; send 25c for samples and particulars; make money. Eyer Sales Co., 9643 Ave. M., Chicago, Ill.

GOOD income refinishing chandeliers, brass beds, automobiles by new method, producing amazing results; no capital or experience necessary; particulars free. Gunmetal Co., Ave. H, Decatur, Ill.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Photo Plates, Pennants. Rejects credited. Prompt shipments; samples and catalogues free to agents; 30-days' credit. Jas. C. Bailey Co., M-1, Chicago.

RUSH postal for Free Sample "Spik & Span." Wonderful new washing tablet. Washes clothes spotless, without rubbing. Tremendous seller. 200% profit. Free Samples to boost sales. Newberry Co., 212 Peoria, Chicago, Ill.

"RUST-GO"—Selling like wildfire—$8-$15 daily. Something new. Every house buying. Removes Rust, Ink and Stains. Astounding proposition. Lawrence Co., Bowling Green, Ohio.

AGENTS—Self-threading needles; sell at sight; package and terms 10c. Clarence Maugans, Anderson, Ind.

AGENTS: Neverfail Iron Rust and Stain Remover. Big summer leader. Huge profits. Big line. Credit; sample. Sanford-Beal Co., Inc., Newark, New York, Dept. C.

$100 PER month easily made during spare time selling one of the oldest fully guaranteed automobile tires. Prices low enough to permit selling to dealers and garages. Write at once if you want to represent us in your district. Economy Auto Supply House, 4353 Cottage Grove, Chicago.

SNYDER'S Toilet Preparations and Household necessities are big values; big profit makers; sell themselves; Start making money immediately. T. H. Snyder & Co., Dept. M., Cincinnati, O.

RELIABLE People Wanted—Place Eggine in stores and appoint agents. Takes place of eggs in baking and cooking at 9c doz. Large package and particulars 10c postpaid. Morrissey Company, 4403-5 Madison, Chicago.

WHO wants to make more money selling brushes that every household needs? Special method of getting entrance to demonstrate. Fuller Sanitary Brushes are nationally advertised — largest output — best terms and prices—western distributing stations. Your territory is valuable. Write. Fuller Brush Company, Hartford, Conn.; Rock Island, Ill.

233% PROFIT—$2.80 on each set sold. Newly invented Jubilee Spark Intensifier. Banishes spark-plug trouble forever. Sells on sight. Huge profits. Exclusive territory. Hurry! Jubilee Mfg. Co., Dept. M-7, Omaha, Neb.

STOP Here—Just Out—Eisen Regulator for Ford Headlights. Selling like wildfire everywhere. Gives splendid driving light at low speed—keeps bulbs from burning out—works entirely automatically. Needed on every Ford. Big profits quick. Listen: Hopkins, Tenn., cleared $16.20 first day. McFarland, Nebr., made $3,492 in 17 weeks. Siler, Okla., sells 12 a day—profit $20. No experience or capital needed. We show you how. Sales guaranteed. Hurry, don't delay; write now for special information how you can make money. Address Eisen Instrument Co., 645 Valentine Bldg., Toledo, Ohio.

LARGE Manufacturer wants agents to sell guaranteed custom-made raincoats. We deliver to customer. Enormous profits. Defy competition. 1917 Outfit Free. "Aerco," 175 East Broadway, Desk P, New York.

GET into biggest money-making end automobile business—replacing necessary equipment. Live, ambitious men wanted as special factory representatives, exclusive territory, taking orders for tops, top coverings, seat covers, "Stik-Tite" windows. No experience necessary. No capital required. No competition. Copyrighted system protects you. Free catalog, samples, full details. Cincinnati Auto Specialty Company, Dept. MC-67, Cincinnati, Ohio.

THEY sell themselves; big profits. Wire Products Co., Scranton, Pa.

MEN and women make $3.00 to $6.00 a day. Easy work, product light and compact. Needed in every home. Money-back guarantee. Send 25c for outfit worth 50 cents. Make sales from it. Write today for your territory and details. Radic Company, P. O. Box 721, Waterbury, Conn.

AGENTS: $8 to $12 for six hours' work. Big money in automobile transfer initials and flags—applied in ten minutes. $1.35 profit on $1.50 order. Get this quick. Write today. Auto Accessories Co., 28 Advertisers Bldg., Dayton, O.

AGENTS Wanted—To advertise our goods by distributing free samples to consumer. 90 cents an hour. Write for full particulars. Thomas Mfg. Co., 562 North St., Dayton, O.

AGENTS, grab this 25c household specialty. Lightning seller. One agent sold 160 one day. 140% profit. Write today. G. L. Erwin & Co., Manufacturers, 2113B, Harrison St., Chicago.

AGENTS: $30 to $100 a week. Free samples. Gold sign letters for Stores and Office Windows. Anyone can do it. Liberal offer to general agents. Metallic Letter Co., 407 N. Clark, Chicago.

EXCEPTIONAL opportunity selling Sanitary Brushes. Large profits, no permanent capital required. Every home a customer. Special selling help for agents. Proposition free. Sample ten cents. Puritan Sales Company, Dept. M. 1966 Broadway, N. Y.

AGENTS: Automatic Automobile Signal just patented; enormous seller; big profits. Territory reserved. Write: Jordan, 1920 9th St., Washington, D. C.

AGENTS Wanted—500% profit. Our sign letters get the money. Easily applied. Sample free. Anderson Stores Co., 2444 Chicago Ave., Chicago.

400% PROFIT for Hustling Agents. Our Magnetic Razor Stick sharpens any style razor or safety blade. Simply apply to strop. Endorsed everywhere. Sensational seller. Guaranteed. Sample 15 cents. Kenedge Company, Sheboygan, Wisconsin.

AGENTS—Wake up: We've got it, greatest invention for Automobiles; out seven weeks; Owners and garages buying at sight a necessity; Sawyer's profits $271 first week, McDonalds $146 three days; protected territory; money-back guarantee. Homestead Engineering Laboratories Co., Homestead, Pa.

DISCOVERED! Extraordinary New Proposition. Supreme Opportunity. $200 per week Easy, demonstrating marvelous Adding Machine. Retails $7.50. Work equals $300 machine. Subtracts, Multiplies, Divides, automatically. Whirlwind in speed. Guaranteed Five Years. Used by U. S. Government. Sells everywhere. Amazing profits. Write quick for exclusive territory. Calculator Corp., Dept. PM, Grand Rapids, Mich.

FLAG Emblems for Window Panes, Automobile Wind Shields and Headlights. Selling like wildfire—Something new—Retail price and samples to agents 25c. 12 for $2.00. Quantity discounts. Translucent Medalyun Co., Fisher Bldg., Chicago.

SELL everywhere unique metal preparedness novelty. Patented. Constructive. Big profits. Sample quarter. Refund guarantee. Heinze Manufacturing Co., 178 Avery, Detroit.

$75 WEEKLY and up selling Mexican Diamonds. Exactly resemble genuine; same Rainbow Fire; Stand tests; sell at sight. Repeat orders. Write quick for Sample Case offer free. Mexican Diamond Importing Co., S. W. Las Cruces, New Mexico.

EARN $50 to $100 monthly distributing Parker Hosiery to repeat customers at mill prices. All or spare time. Protected territory. Credit. D. Parker Mills, 2733 No. 12th St., Philadelphia, Pa.

AGENTS, Make Big Money; fast office seller; particulars and samples free. One Dip Pen Co., Dept. 2, Baltimore, Md.

SIGN Letter Agents and Painters; 500% Profit. Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 464 N. Clark St., Chicago.

PORTRAIT Agents, new and old, write us. We know what you want and need. Established 17 years. Pioneer, 1244 W. 63rd St., Chicago.

LUMINOUS Paint! Shines in the dark. Big seller to hotels, garages, etc. Any article can be coated with splendid results, watches, clocks, electric switch plates, crucifixes, match boxes, etc. (Everlasting.) Only 25c a bottle. Particulars free. Luminous Paint Co., B-10 Douglas Park Station, Chicago, Ill.

AGENTS—100% Profit. Three-In-One Shoe Brush, Polish, Dauber and Shiner—all in one. Costs only 1/6 of a cent a shine. Write quick for territory and free pocket sample. Fountain Shoe Brush Co., 1462 North St., Dayton, O.

EXCLUSIVE selling rights given for our Wonderful Triplex Folding handbag and other sellers. None sold in Stores. Write for terms and catalogue. Diamond Bros., 35 West 21st Street, New York.

CALIFORNIA Flower Bead Necklaces beat anything for quick sales and profits. Absolutely new. Write for agent's proposition. Mission, 2819 PM, West Pico, Los Angeles, Calif.

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight. 200 to 500 per cent profit. One agent's sales $620 in six days; another $32 in two hours. Monroe Mfg. Co., X6, La Crosse, Wis.

"GOLDINE" Sign Letters—1,000% profit. Particulars free. Johnston Co., Quincy, Ill.

MARRIED Salesmen and Agents—Wives to demonstrate in dept. stores, on salary. Easy sales to jobbers, dealers, consumers. All or part time, or side line. Appoint sub-agents. Silvron, the Silver-plating polish—needed in every home, hotel, restaurant, and garage. Guaranteed to Deposit Pure Silver. Write for proposition and sample. Exclusive territories open. Silvron, 157 Cedar St., N. Y.

AGENTS—Ho-Ro-Co Skin Soap and Toilet Goods plan beats everything for agents' profits. "Ho-Ro-Co.," 112 Locust St., St. Louis, Mo.

AGENTS—"Exclusive features" are what make easy sales—I can gain attention, close the sale and collect the money on six customers with the exclusive features of my non-alcoholic flavoring extracts, while you are struggling with one customer on the old commonplace line of talk. So can you! Prove it! Write today—big summer sellers—extra summer profits. J. M. Pitkin Co., 626 R. St., Newark, New York.

LARGE Manufacturer wants representatives to sell shirts, underwear, hosiery, dresses, waists, skirts, direct to homes. Write for free samples. Madison Mills, 586 Broadway, New York City.

WANTED—New Ideas. Write for list of Patent Buyers and Inventions Wanted. $1,000,000 in prizes offered for inventions. Our Four Books sent free upon request. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

AGENTS Wanted: Sell Polishing Cloths, Rust Remover, Food Flavors, etc. 130 household necessities, guaranteed line, big profits, quick repeater, permanent business. Stuart & Co., 16 Main St., Newark, N. Y.

TAKE orders for men's custom tailoring, part time or all time. We furnish samples and everything needed to make a success without experience. Low prices; fit guaranteed or money refunded. You make good money on every order. You can wear swell clothes for almost nothing. Write quick for samples and all information if you live in a town smaller than 5,000 or on R. F. D. Knickerbocker Tailoring Co., Dept. 613, Chicago.

AGENTS Wanted for best-selling household specialties on earth; goods sell themselves; write at once. The Addison Co., 224 Frankline Av., Scranton, Pa.

AGENTS make $100 monthly selling our 500 handy household articles. Catalogue free. Scheff Company, Desplaines, Ill.

MAKE and Sell Your Own Goods. Formulas by Expert Chemists. Manufacturing Processess and Trade Secrets. Formula Catalog for Stamp. Blake Mystic Company, Washington, D. C.

$1,000 PER Man per county. Strange invention startles world—agents amazed. Ten inexperienced men divide $40,000. Korstad, a farmer, did $2,200 in 14 days. Schleicher, a minister, $195 in first 12 hours. $1,200 cold cash made, paid, banked by Stoneman in 30 days; $15,000 to date. A hot or cold running water bath equipment for any horse at only $6.50. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 311 Allen Bldg., Toledo, Ohio.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS, 500% Profit, Sign-Letters for office and store fronts. Samples and particulars Free. Inter-States Letter, 2424 N. Halsted St., Chicago.

A NEW, Novel, and Clever Invention; wonderfully attractive; a market in every home; good profits; big demand; particulars free. Shomescope Mfg. Co., 523 W. 13th St., Kansas City, Mo.

PORTRAIT Agents: Deal with artist direct. Good work at reasonable prices. Chas. A. Sweet, Artist, 520 New Era Bldg., Chicago, Ill.

AGENTS—Just out, New Dollar Winner, One-Hand Speed Wrench. Machinists, autoists, farmers, everybody buys at sight. 100% profit. Make $30 to $50 weekly. Toledo Speed Wrench Co., Toledo, Ohio.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

AGENTS sell Reliable Custom-Made Raincoats and Gabardines. Big commission. Complete sample line free. Temple Raincoat Company, Templeton, Mass.

FREE sample with particulars. No splashing water strainers. Easy seller. Returns big. Experience unnecessary. Union Filters Co., New York.

ONE good man wanted in each small town to take orders for tailoring in spare time or as a regular business. Good profits. Get your own clothes at special inside wholesale prices. Perfect fit and satisfaction guaranteed or no pay. Wonderful opportunity, experience not needed. Beautiful sample book and fashion plates free. Banner Tailoring Co., Dept. 562, Chicago.

DECALCOMANIA Transfer Initials and Monograms: You apply them on automobile while they wait; cost 2c each; profit $1.38 on $1.50 job; free particulars. Auto Monogram Supply Co., Dept. 1, Niagara Bldg., Newark, N. J.

A FEW reliable men or women to handle my 1916 "Business Guide." Sells everywhere. Beginners clear $7 per day. 60% commission. Outfit free. Prof. Nichols, Box P. M., Naperville, Ill.

HUGE profits selling Nibco Sanitary Brushes, Auto Washers, Brown Beauty Adjustable Floor Mops, Dustless Dusters, and other specialties. Big line. Fast sellers. Write today. Silver-Chamberlin Company, Department M, Clayton, New Jersey.

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AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Pease Die Works, Dept. M., Winchester N. H.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalogue and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

GENTLEMEN: Mason sold 18 Sprayers and Auto Washers one Saturday. Profits $2.00 each—Square Deal. Write Rusler Company, Johnstown, Ohio.

MAN or Woman to travel for old-established firm. No canvassing; $1,170 first year, payable weekly, pursuant to Contract. Expenses advanced. G. E. Nichols, Philadelphia, Pa., Pepper Bldg.

AGENTS — Sell rich-looking imported 36x68 rugs, $1 each. Carter, Tenn., sold 115 in 4 days. Profit, $57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post prepaid, 98c. E. H. Condon, Importer, Stonington, Maine.

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AGENTS, Salesmen, brand new made to measure raincoat proposition. Big demand, big commissions, biggest line of all, we deliver and collect, samples free. Write today. Rainproof Coat Co., 433 St. Clair St., Toledo, Ohio.

NEWEST Home Invention now ready for agents, side-line men, demonstrators. Automatic Sash Lock. Prevents burglary; permits ventilation; stops rattling. Locks either sash any position. Homes and offices buy two to ten each. Enormous demand everywhere. To prove it's greatest agent's article we'll postpay 25c sample for 10c. Try it; then you'll order a gross. Write now for sample and "No-talking" Sales Plan. Slonaker Mfg. Co., 410 Standard Theatre Bldg., Cleveland, Ohio.

MERCHANTS Buy at Sight. New changeable letter sign for window advertising. Large metal sign with 270 letters. Sells $150. 300% profit. Greatest seller ever invented. Write for proposition. Changeable Sign Co., E. 102, Cleveland.

AGENCIES WANTED

WANTED—Good articles for agents and mail-order. Address: Manager, P. O. Box 9, Chatham, Ontario, Canada.

SALESMEN WANTED

SALESMEN—Handle our Gas Saver as sideline. On any automobile increases mileage two to ten miles per gallon, kills carbon. Tremendous field. Big margin for you. Some exclusive territory still open. Full-time high-grade agents also wanted. Write today. S & H Mfg. Co., Dept. 4, 406 Palace Bldg., Minneapolis, Minn.

WANTED—Native salesmen in Hawaii, Cuba, Philippines and South America, to handle America's greatest specialty proposition. Sells to housewives, auto-owners, garages, hotels, cafes, etc.; light, easily carried. Big commissions. Particulars and sample for stamped addressed envelope. The American Mfg. & Sales Co., 210 Suffern Bldg., Decatur, Illinois.

SALESMEN, local, in every city and country, to manage agents and canvassers; $300 capital necessary; every one who owns a phonograph, of any make, will buy it on demonstration; a clean, legitimate money making proposition for any man who can qualify. Wilson-Laird Phonograph Co., Inc., Department P., 136 Liberty St., New York City.

TRAVELING salesman for side line to establish agencies for fuel saving devices. University tests show 25% saving. Wolff Fuel Saver Co., Lytton Bldg., Chicago.

WANTED—Salesmen everywhere. 3,500 mile factory guaranteed tire. Large commission for exclusive territory. Opportunity. References. W. & G. Tire Co., Flatiron Building, New York.

SALESMEN—Sell beautiful 28x58 Artzkraft felt rugs for $13.50 per doz. Your profit $2.50 per doz. Keiso, Battle Creek, Mich., sold 30 doz. last week, his profit $75. Sample Rug prepaid $1.50. E. H. Condon, Mfgr., 12 Pearl St., Boston, Mass.

YOUNG men everywhere as Cigar Salesmen. Start $20 weekly. Neway Sales Co., Hartford, Conn.

WANTED — Representatives everywhere. Exclusive territory. Gold sign letters for stores and office windows. Any one can put on. Write today for free sample. Metallic Letter Co., 403 N. Clark St., Chicago.

SALESMEN—Acquainted with grocery trade. Large demand; liberal commission; pocket sample. Wirth Salesbook Co., Dept. P., Chicago.

EARN $5,000 to $20,000 yearly. New business necessity. Retails $5 to $200. 100-200% profit. Purchaser satisfied or money refunded. No competition. Exclusive territory. Free samples. Sayers, 408 Wainright, St. Louis.

SALESMEN—Wanted everywhere to sell Ajax Chemical Fire Engines. Liberal commission on every Engine sold. An average of one or two machines a week would earn you $2,000 to $4,000 a year. Factories, Stores, Industrial Plants, Private Estates, etc., all use Ajax Engines. No capital required. Goods well advertised. Ajax Fire Engine Works, 95 W. Liberty St., New York.

SALESMEN—Get our plan for Monogramming Automobiles and motorcycles by transfer methods. Very large profits. Motorists' Accessories Co., Mansfield, O.

HELP WANTED

MECHANICS Wanted. Minot Auto Company of Minot, North Dakota, Overland distributors. Largest shop in Northwest. Only A-1 mechanics wanted. Fifty cents an hour for good men. Year around employment.

THE way to get a Gov't Job is through the Washington Civil Service School. We prepare you and you get a position or we guarantee to refund your money. Write to Earl Hopkins, President, Washington, D. C., for Book FK-29, telling about 292,926 Gov't Positions with lifetime employment, short hours, sure pay, regular vacations.

CHAUFFEURS get $25 week. Learn while earning. Sample lessons free. Franklin Institute, Dept. C-801, Rochester, N. Y.

GET a sure job with big pay, steady work, short hours, regular vacations, rapid advance. Thousands of positions open with Uncle Sam. I will prepare you in a few weeks at small cost. Write immediately for big Free Book DU-29 with special offer. Earl Hopkins, Washington, D. C.

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CASH paid for butterflies, insects. Some $1 to $7 each. Easy work. Even two boys earned good money with mother's help and my pictures, descriptions, price list, and simple instructions on painless killing, etc. Send 2c stamp at once for prospectus. Sinclair, Box 244, D 6, Los Angeles, Cal.

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FOREMEN, Shopmen, and Officemen Wanted to work spare time as special representative of large well-known mail-order house, selling Watches, Diamonds and Jewelry on Credit. Liberal commissions and exclusive sales rights granted. No investment or deposit required for outfit or samples. Write at once for details. Address S. D. Miller, Dept. 14, Agency Division, Miller Bldg., Detroit, Mich.

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GOOD income refinishing chandeliers, brass beds, automobiles by new method, producing amazing results; no capital or experience necessary; particulars free. Gunmetal Co., Ave. G, Decatur, Ill.

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INVENT Something; Your Ideas may bring wealth. Free book tells what to invent and how to obtain a patent, through our credit system. Talbert & Parker, 4102 Talbert Bldg., Washington, D. C.

FIREMEN, Brakemen, railroads everywhere; beginners paid $125-$150 monthly; wages recently increased one-fourth; positions guaranteed. Railway Association, Dept. 254, Brooklyn, N. Y.

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BE a Mirror Expert. Good income; spare time home at first; no capital; we train, start you making and silvering mirrors; French method. Free prospectus. W. P. Derr, Pres., 579 Decatur, Brooklyn, N. Y.

WANTED—Draftsmen and Designers. Cleveland Engineering Agency, Rose Building, Cleveland.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers' League, 230 Wainwright, St. Louis.

WANTED—An Idea! Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Needed Inventions" and "How to Get Your Patent and Your Money." Randolph & Co., Patent Attorneys, Dept. 144, Washington, D. C.

GOVERNMENT Examinations. Most thorough preparation, $5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

MECHANIC or inventor capable of making certain improvements. Big money for right party. B-7 care Patent News, Washington, D. C.

WANTED

WILL Buy—Small article to manufacture and sell to automobile trade. Crum Manufacturing Co., Ottawa, Kansas.

PICTURES, colored and lithographed, miscellaneous sizes, not to exceed 18"x26", assorted and unmounted. Box 172, Cleveland, O.

SLOT machines of all kinds—new or used. Give description, condition and spot cash price. Box 172, Cleveland, Ohio.

FOR SALE

STANLEY 10-hp. Runabout, 10-hp. and 20-hp. engine. 20 and 13 foot speed boats. Coffee grinder, Slicing machine. Owner, Box 695, South Norwalk, Conn.

UNIVERSAL Knitting Machines. Many styles, hand or power. For Catalogue, address Daniel Buoker, Peabody, Mass.

POWERFUL Marine day and night glasses with case, 25 mile adjustment, $9.50. Satisfaction or money returned. Wells Curiosity Shop, 20 South Second Street, Philadelphia, Penna.

SALE OR EXCHANGE

OLD Violin to Exchange for any Standard make shotgun or rifle. M. L. Richards, Lawrence, Mass.

IF you want to sell, buy, or trade anything, write Home Specialty Co., Exchange Dept., Box 223, Cleveland, Ohio.

GUNS, SPORTING GOODS, ETC.

BARGAINS. Will trade, buy or sell Guns, Rifles, Revolvers. Send Stamp for Bargain List. Oldest, most reliable Dealer in Country. Wm. R. Burkhard, 143 East Fourth Street, St. Paul, Minnesota.

BUY, sell, exchange all sorts old-time and modern Firearms. Stephen Van Rensselaer, Antiques, 805 Madison Ave., New York.

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SPECIAL bargains in second hand Attrition mills, burr mills, crushers, corn shellers, bran dusters, dust collectors, purifiers, reels, double, single, 2 and 3-pair high roller mills, sieve bolters, receiving separators, scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

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"RED-DEVIL" Glass Cutter, improved type; cuts any thickness. Saves labor, time, glass. Sample, 10c. Booklet free. Smith & Hemenway Company, 97B Chambers Street, New York.

FIFTY Light Dynamo, Switchboard, Battery $165. Guaranteed. Engine $32. Magneto $5. Wobus, Fullerton Building, St. Louis.

INDICATOR—Trill "Triumph" steam engine indicator $50.00. C. H. Norton, 12 W. 3rd St., Cincinnati, O.

PULLEYS, Gears, Sprockets, Shafting, Hangers. See page 147. W. A. Jones Foundry & Machine Co., Chicago.

GRINDING machines, sharpens tools, cutlery, etc., without touching tools with hands. Mustin Mfg. Co., Newport, Kentucky.

38-INCH lathe with 10-ft. bed. 4 side wood moulder. W. H. Pence Machine Co., Fairfield, Ia.

PRINTING outfit with power press at low price. Stewart Typewriter Exchange, Mattoon, Ill.

TOOLS—for shop, factory, garage and home—many high-class tools attractively priced in our "Odds and Ends" pamphlet—which is mailed free on request by Montgomery & Co., Inc., 105 Fulton St., New York City.

WIRE—all sizes—⅜ to No. 16. Copper, tinned, galvanized and plain steel wire for sale. Cooley Mfg. Co., 553 W. Monroe St., Chicago, Ill.

SMALL Bench lathe for $3. See our ad page 177.

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TOOL Cases. For Carpenters and Machinists. Write for catalog. Keystone Case Co., 215 Keystone Ave., Chicago.

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ENGINE User Agents Wanted to use, demonstrate and sell "Big Ben," wonderful new 2½ H. P. gasoline engine. Free introductory offer and free details. C. Bennighofen & Sons, Dept. P, Hamilton, Ohio.

ELECTRIC vehicle motor generator charging set with rheostat, complete; little used, excellent condition, A. C. motor, 2-h. p., 220-volt, single-phase 60-cycle, speed 1800 R. P. M., direct connected to an 80-volt 20-7-10 amp. generator. Lincoln electric make. Call, Alms & Doepke Garage, Elliott St., near Broadway, Cincinnati. Original cost $275.00.

MOTORS. Exceptional values, alternating and direct current motors. Reliable makes only. Tell us your needs. Illustrated catalog, supplies and motors. Hyre Electric Co., 612-BM South Dearborn St., Chicago.

CHARGING Dynamos—Several hundred small machines from bankruptcy stock. Also lighting dynamos and several moving picture Arc generators. One and three phase motors up to 5 H. P. in stock for immediate shipment. ¼ H. P. A. C. motors $15. All sizes—low prices. Write for list. Johnston, West End, Pittsburgh, Pa.

TEN stationary steam engines, 15 to 100 H. P. each. Send for description of size wanted. Lucas & Son, Bridgeport, Conn.

WANTED—Electric portable drills, all sizes, both A. C. and D. C. Johnston, West End, Pittsburgh, Pa.

REBUILT Engines — We have rebuilt "Buffalo" Engines, guaranteed, at greatly reduced prices. Write for bargain list. Buffalo Gasolene Motor Co., 1293-1305 Niagara Street, Buffalo, N. Y.

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BLACKSMITHS, Listen! The Blacksmiths come first of all trades. He must make the tools for all, from the Surgeon to the Safe Blower. With Toy's Modern Methods doing hard jobs easy. Forging and making solid welds, hardening and tempering to a standard, with colored tempering charts. All for one dollar. Samples Free. W. M. Toy, Sidney, Ohio.

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RHUMKORFF coil twelve inch spark $60. Wm. Strock, Dyersville, Iowa.

DRY Batteries and Their Construction for All Purposes. A practical handbook of 60 pages with 30 illustrations dealing with batteries for automobiles, gas engines, medical and coil work, electric bells, alarms, telephones, experiments, etc. Price, 25 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

PRACTICAL Electrics—Universal handy book on every-day electrical matters, alarms, batteries, bells, carbons, connections, coils, dynamos, wires, lamps, motors, telephones, etc. 135 pages, 126 illustrations, 25c postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

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ELECTRICIANS: Diagrams, blueprints, information on anything electrical. Send 25c. Explain your problem. Electricians' Service Bureau, Box 3, Brockton, Mass.

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FAVORITE Old Home Songs—No home in the land should be without this book of 200 of the familiar old songs everybody loves. Words and music complete in a substantial volume 9½x7 inches in size. Price 50 cents postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

GREATEST patriotic hit. Get it. "Go, My Son, God Bless You," 15c. Mother to her son wanting to fight for freedom and liberty. Sovereign Pub. Co., 160 Sycamore, Buffalo, N. Y.

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STAMPS—500 fine foreign incl. Mex. War, Salvador, incl. officials, Guatemala, China, etc., only 10c. Best App. Sheets 60 to 80% dis. We give valuable extra Presents free! Big 120 pg. catal. free. We buy stamps. Hussman Stamp Co., St. Louis, Mo.

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PACKET of 23 stamps; no two countries alike, 500 hinges. Set of $1 and $2 U. S. Rev., all for 5c. Mention paper. Miami Stamp Co., Toledo, Ohio.

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THE way to build your Stamp Collection. Send 50 cents for one of my approval Books. Select the stamps you want, to the value of Fifty Cents, and return me the Book. F. J. Pope, Charlotte, Vermont.

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105 CHINA, etc., stamp dictionary, list, 2c. Album (500 illustrations) 3c. Bullard, Sta. A., Boston.

20 UNUSED stamps free. All different. Postage, 2c. Fisk Stamps, Toledo, Ohio.

PACKET "A" 100 varieties foreign stamps, 20c. F. J. Pope, Charlotte, Vermont.

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WILL pay $7.00 for 1853 Quarter; $100.00 for 1853 Half without arrows. $2.00 for 1904 Dollar proof. We buy all rare coins to 1912, cents, nickels, dimes, etc., to dollars, old bills and stamps. Cash premiums paid. Send us 4c. Get our Large Coin Circular. Numismatic Bank, Dept. H, Fort Worth, Texas.

FIVE Villa Coins and Bills, 35c. Villa Silver Dollar, $1.50. Moore Coin Company, Commerce, Texas.

OLD Coins Wanted. 24-page catalog quoting prices paid, 5 cts. A. Kraus, Kraus Bldg., Milwaukee, Wis.

TEN old curious coins; catalogue, package of stamps, mail for two dimes. Vance Supply House, 2125 W. Van Buren St., Chicago, Illinois.

CALIFORNIA gold, quarter size, 27c. $½ size, 55c. $1.00 size, $1.10. Large cent before 1821, Columbian Nickel Coin and Price List 10c. Norman Shultz, King City, Mo.

OLD Coins. Large Spring Coin Catalogue of Coins for Sale, free. Catalogue quoting prices paid for coins, ten cents. William Hesslein, 101 Tremont St., Boston, Mass.

1917 COIN stamp and relic catalog sent on request. Coin Exchange, New Rochelle, New York.

$4.25 EACH Paid for U. S. Flying Eagle Cents dated 1856. We pay cash premiums on hundreds of Old Coins. Send ten cents at once for New Illustrated Coin Value Book 4x7. It may mean your fortune. Clarke & Co., Coin Dealers, Box 15, Le Roy, N. Y.

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A FEW Farms for sale or rent in a beautiful part of West Florida. Northern neighbors. Cooler here in Summer than in the North. Expenses light. Prices for produce good. Most desirable terms offered desirable people. Describe yourself fully. Two million dollars sent North last year from th's county for food-stuffs easily raised here. Chas. A. Dexter, Dexland, Gonzalez, Florida.

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( ) Civil Engineering
( ) Electrical Engineering
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Address.....

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- ☐ Electrician
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Electric Car Running
- ☐ Electric Machine Designer
- ☐ Telegraph Engineer
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ STEAM ENGINEER
- ☐ GAS ENGINEER
- ☐ CIVIL ENGINEER
- ☐ Structural Engineer
- ☐ CHEMICAL ENGINEER
- ☐ ARCHITECT
- ☐ Architectural Draftsman
- ☐ Mine Foreman or Supt.
- ☐ Business (Complete)
- ☐ Bookkeeper
- ☐ Stenographer
- ☐ Advertising Man
- ☐ Salesmanship
- ☐ Window Trimmer
- ☐ Civil Service
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$80 to $250 and more per Month

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- ☐ *Bricklaying*
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(Check course that interests you.)

Name.....

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Take Ten Lessons— then decide

TAKE your pencil now—and make an X in the coupon before the position in life that you want to fill. You will be under no obligation. This little X is an easy thing to make but it will bring to you a vital, inspiring message that will tell just exactly how you can qualify yourself, right in your own home, to fill the position that you are dreaming about.

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.....Building Contractor	.....Bookkeeper
.....Building Superintendent	.....Fire Ins. Inspector
.....Structural Engineer	.....Fire Ins. Adjuster
.....Structural Draftsman	.....Fire Ins. Expert
.....Mechanical Engineer	.....Sanitary Engineer
.....Mechanical Draftsman	.....Master Plumber
.....Civil Engineer	.....Plumbing & Heating Est.
.....Steam Engineer	.....Heating & Vent. Engineer
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We also prepare for civil service examinations in all engineering subjects

Name.....

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We teach how to handle every electrical equipment. You learn to locate trouble quickly. Starting, lighting and ignition troubles can't stump you. 80% of auto troubles are electrical. Electrical Auto Men get big pay, have steady jobs. Garages giving best electrical service get business easily and hold it. You learn how to adjust carburetors, time valves, care for electrical troubles. Complete course as quickly as you like. No matter what business you are in, you can succeed if you take I. M. I. Course.

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Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting
- ☐ Electric Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ Metallurgist or Prospector
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
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- ☐ Cartooning
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ German
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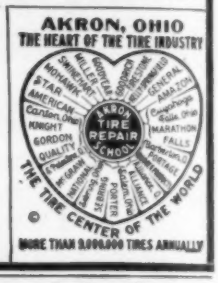

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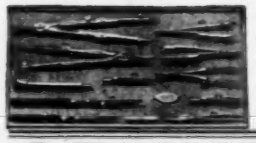

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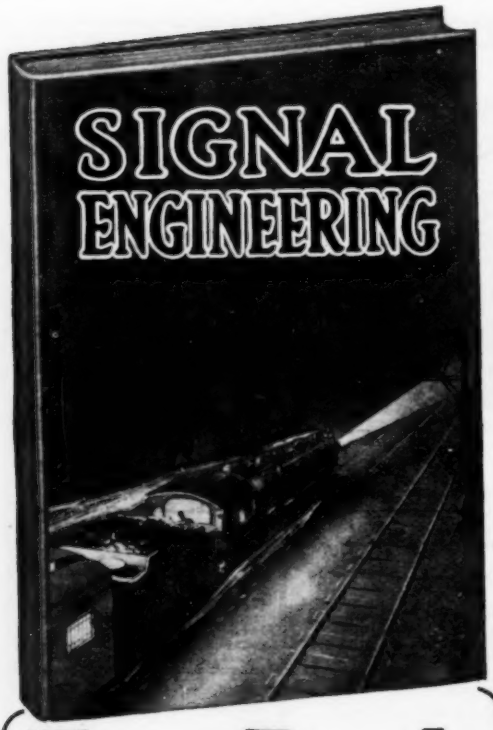

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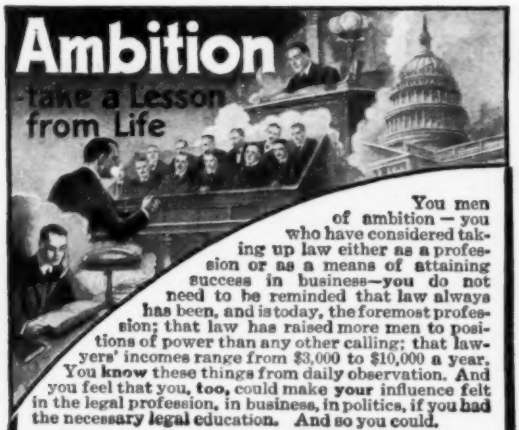

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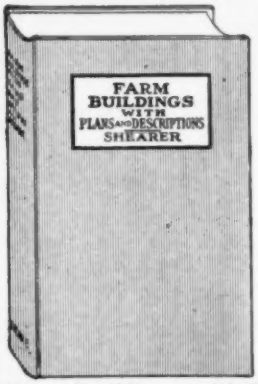

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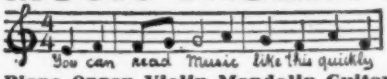

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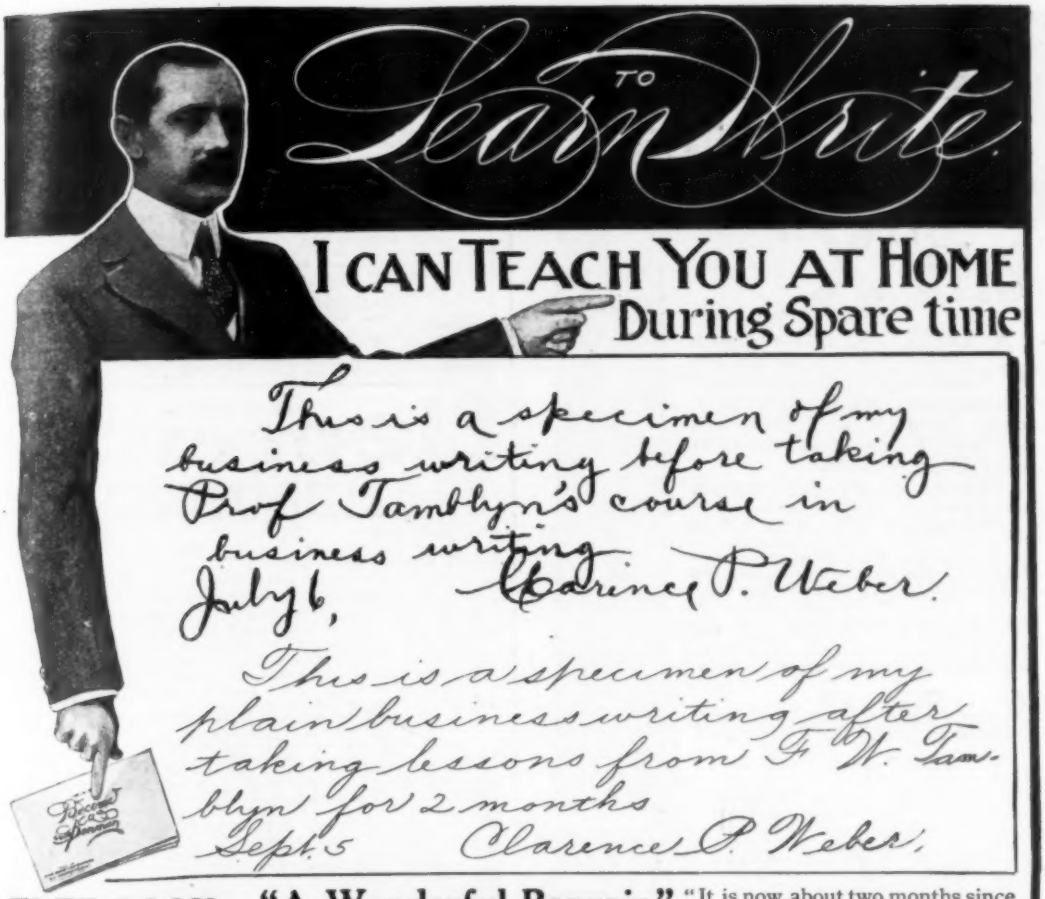

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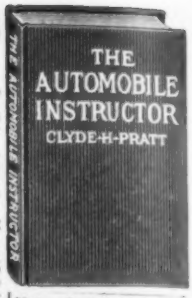

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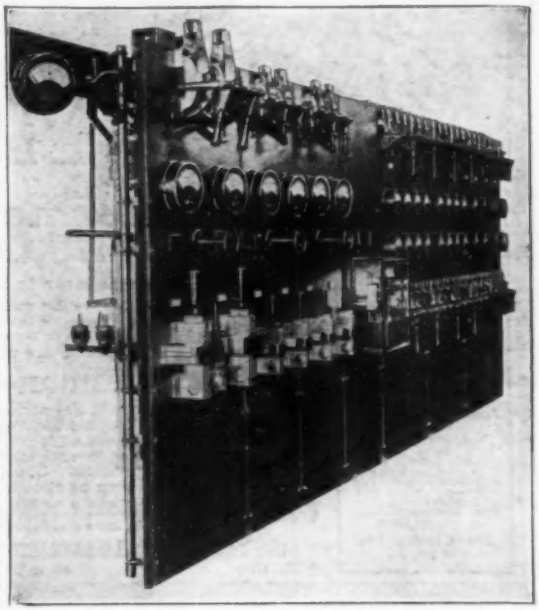

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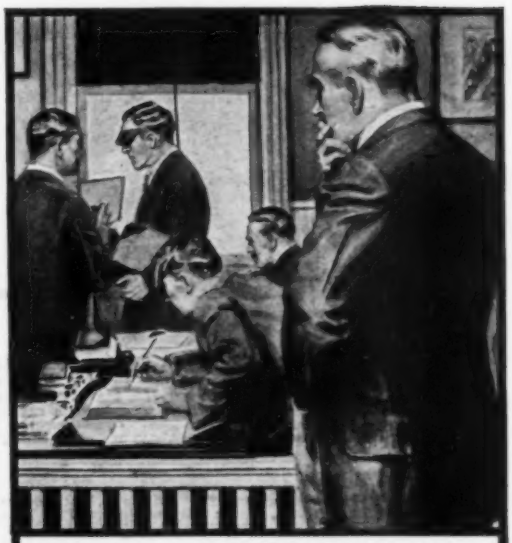

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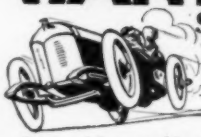

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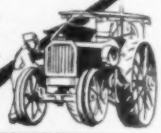

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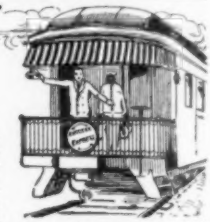

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State of Illinois, County of Cook. ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, who, having been duly sworn according to law, deposes, and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 6 No. Michigan Ave. Editor, H. H. Windsor, 6 No. Michigan Ave. Managing Editor, J. L. Peabody, 6 No. Michigan Ave. Business Manager, H. H. Windsor, 6 No. Michigan Ave. 2. That the owners are (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock): H. H. Windsor, 6 No. Michigan Ave. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are (If there are none, so state): None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bond, or other securities than as so stated by him.

H. H. WINDSOR.

Sworn to and subscribed before me this 27th day of March, 1917.

J. GRAHAM,
Notary Public.

(My commission expires June 17, 1920.)

◆ ◆ ◆

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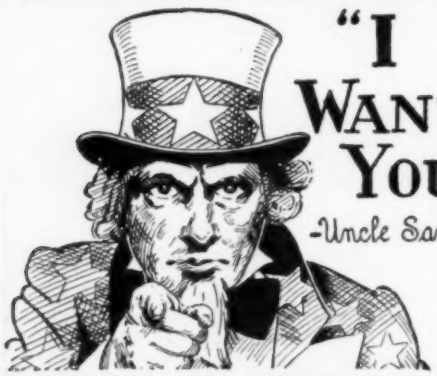

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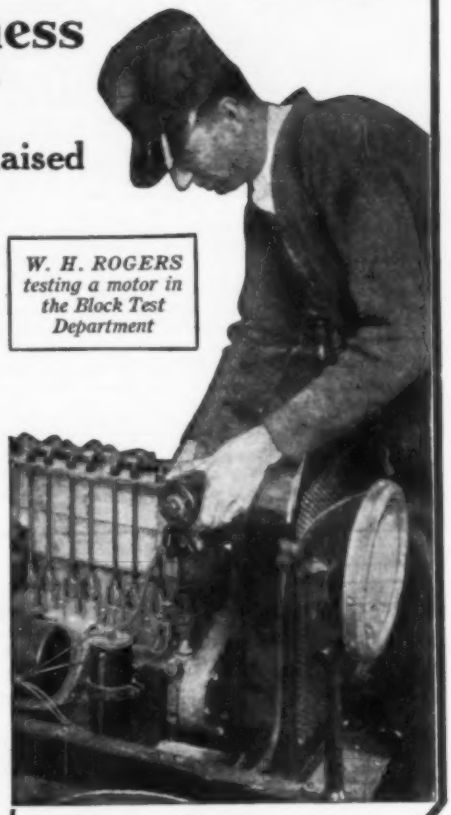

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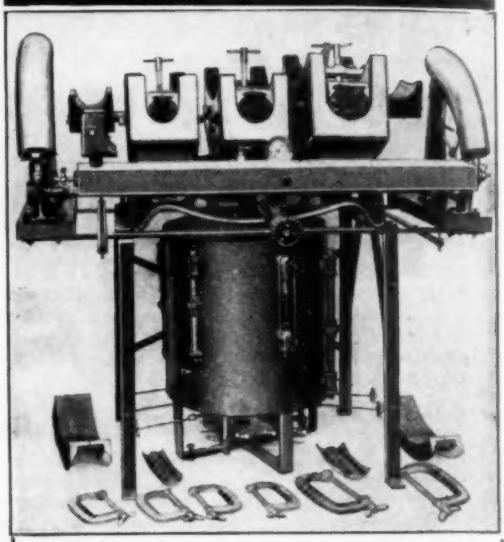

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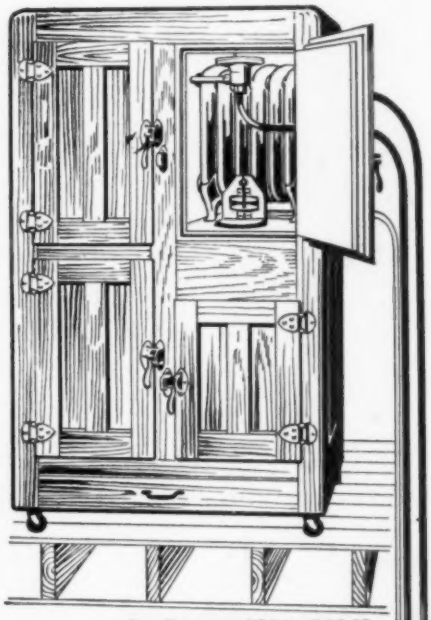

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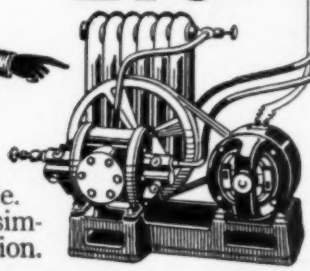

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Reduces Lumber Waste from 18% Down to 2%

THE material for a complete home is furnished from a single source and at a single fixed price—eliminating extras. All of the lumber, framing, sheathing, building paper, shingles, siding, porch work, outside finish, flooring, windows, doors, stairways, interior woodwork, nails, glass, paints, varnish, stains, and lath and plaster are included in one price and shipped together at one time. Delays usually experienced waiting for deliveries of material are thus done away with.

Aladdin lumber, millwork and interior finish are all of the very highest grades and highest quality to be found in the forests. All exposed lumber inside and outside is clear and free from knots.

The Aladdin Book of Homes illustrates and describes over one hundred modern homes, priced from $100 to $8000—bungalows, two-story dwellings of stucco, siding and shingle exteriors, summer cottages, barns, and garages. If you expect to do any building, you should certainly have a copy. Send stamps for Aladdin Book of Homes No. 180.

The Aladdin Co. 1462 Aladdin Ave. Bay City, Michigan

Canadian Branch: Canadian Aladdin Co., Ltd., C. P. R. Building, Toronto, Ontario

How I Raised My Earnings from $30 to $1000 a week

The Story of a Young Man's Remarkable Rise, as Told by Himself

THREE years ago I was earning $30 per week. With a wife and two children to support it was a constant struggle to make both ends meet. We saved very little, and that only by sacrificing things we really needed. To-day my earnings average a thousand dollars weekly. I own two automobiles. My children go to private schools. I have just purchased, for cash, a $25,000 home. I go hunting, fishing, motoring, traveling, whenever I care to, and I do less work than ever before.

What I have done, anyone can do—for I am only an average man. I have never gone to college, my education is limited, and I am not "brilliant" by any means. I personally know at least a hundred men who are better business men than I, who are better educated, who are better informed on hundreds of subjects, and who have much better ideas than I ever had. Yet not one of them approaches my earnings. I mention this merely to show that earning capacity is not governed by the extent of a man's education and to convince my readers that there is only *one* reason for my success—a reason I will give herein.

One day, a few years ago, I began to "take stock" of myself. I found that, like most other men, I had energy, ambition, determination. Yet in spite of these assets, for some reason or other I drifted along without getting anywhere. My lack of education bothered me, and I had thought seriously of making further sacrifices in order to better equip myself to earn more. Then I read somewhere that but *few millionaires* ever went to college. Edison, Rockefeller, Hill, Schwab, Carnegie—not one of them had any more schooling than I had.

One day something happened that woke me up to what was wrong with me. It was necessary for me to make a decision on a matter which was of no great consequence. I knew in my heart what was the right thing to do, but something held me back. I said one thing, then another, I decided one way, then another. I couldn't for the life of me make the decision I knew was right.

I lay awake most of that night thinking about the matter—not because it was of any great importance in itself, but because I was beginning to discover myself. Along towards dawn I resolved to try an experiment. I decided to cultivate my will power, believing that if I did this I would not hesitate about making decisions—that when I had an idea I would have sufficient confidence in myself to put it "over"—that I would not be "afraid" of myself or of things or of others. I felt that if I could smash my ideas across I would soon make my presence felt. I knew that heretofore I had always begged for success—had always stood, hat in hand, depending on others to "give" me the things I desired. In short, I was controlled by the will of others. Henceforth, I determined to have a strong will of my own—*to demand and command what I wanted.*

But how shall I begin? What shall I do first? It was easy enough for me to determine to do things—I had "determined" many times before. But this was a question of will power, and I made up my mind that the first step was to muster up enough of my own will power to stick to and carry out my determination.

With this new purpose in mind I applied myself to finding out something more about will power. I was sure that other men must have studied the subject, and the result of their experience would doubtless be of great value to me in understanding the workings of my own will. So, with a directness of purpose that I had scarcely known before, I began my search.

The results at first were discouraging. While a good deal had been written about the memory and other faculties of the brain, I could find nothing that offered any help to me in acquiring the new power that I had hoped might be possible.

But a little later in my investigation I encountered the works of Prof. Frank Channing

Haddock. To my amazement and delight I discovered that this eminent scientist whose name ranks with James, Bergson and Royce, had just completed the most thorough and constructive study of will power ever made. I was astonished to read his statement, "The will is just as susceptible of development as the muscles of the body"! My question was answered! Eagerly I read further—how Dr. Haddock had devoted twenty years to this study—how he had so completely mastered it that he was actually able to set down the very exercises by which anyone could develop the will, making it a bigger, stronger force each day, simply through an easy, progressive course of Training.

It is almost needless to say that I at once began to practice the exercises formulated by Dr. Haddock. And I need not recount the extraordinary results that I obtained almost from the first day. I have already indicated the success that my developed power of will has made for me.

But it may be thought that my case is exceptional. Let me again assure you that I am but an average man, with no super-developed powers, save that of my will. And to further prove my contention, let me cite one or two instances I have since come across, which seem to show conclusively that an indomitable will can be developed by anyone.

One case that comes to my mind is that of a young man who worked in a big factory. He was bright and willing, but seemed to get nowhere. Finally he took up the study of will training, at the suggestion of Mr. W. M. Taylor, the noted efficiency expert and in less than a year his salary was increased 800%. Then there is the case of C. D. Van Vechten, General Agent of the Northwestern Life Insurance Company, Cedar Rapids, Iowa. Just a short time after receiving the methods in will development suggested by Prof. Haddock, he felt that they would be worth from $3,000 to $30,000 to him.

Another man, Mr. H. D. Ferguson, residing in Hot Springs, Ark., increased his earnings from $40 a week to $90 a week in a remarkably short space of time after he began the study of will training. These are but a few—there are many other equally amazing examples which I personally know about. And aside from the financial gain, this training has enabled thousands to overcome drink and other vices almost overnight—has helped overcome sickness and nervousness, has transformed unhappy, envious, discontented people into dominating personalities filled with the joy of living.

Prof. Haddock's lessons, rules and exercises in will training have recently been compiled and published in book form by the Pelton Publishing Co., of Meriden, Conn. Mr. Pelton has authorized me to say that any reader who cares to examine the book may do so without sending any money in advance. In other words, if after a week's reading you do not feel that this book is worth $3, the sum asked, return it and you will owe nothing. When you receive your copy for examination I suggest that you first read the articles on: the law of great thinking; how to develop analytical power; how to perfectly concentrate on any subject; how to guard against errors in thought; how to drive from the mind unwelcome thoughts; how to develop fearlessness; how to use the mind in sickness; how to acquire a dominating personality.

Some few doubters will scoff at the idea of will power being the fountainhead of wealth, position and everything we are striving for, and some may say that no mere book can teach the development of the will. But the great mass of intelligent men and women will at least investigate for themselves by sending for the book at the publisher's risk. I am sure that any book that has done for me—and for thousands of others—what "Power of Will' has done—is well worth investigating. It is interesting to note that among the 150,000 owners who have read, used and praised "Power of Will," are such prominent men as Supreme Court Justice Parker; Wu Ting Fang, Ex-U. S. Chinese Ambassador; Lieut.-Gov. McKelvie, of Nebraska; Assistant Postmaster-General Britt; General Manager Christeson, of Wells-Fargo Express Co.; E. St. Elmo Lewis; Governor Arthur Capper, of Kansas, and thousands of others.

As a first step in will training, I would suggest immediate action in this matter before you. It is not even necessary to write a letter. Use the form below, if you prefer, addressing it to the Pelton Publishing Company, 13-K Wilcox Block, Meriden, Conn., and the book will come by return mail. This one act may mean the turning point of your life, as it has meant to me and to so many others.

PELTON PUBLISHING COMPANY
13-K Wilcox Block, Meriden, Conn.

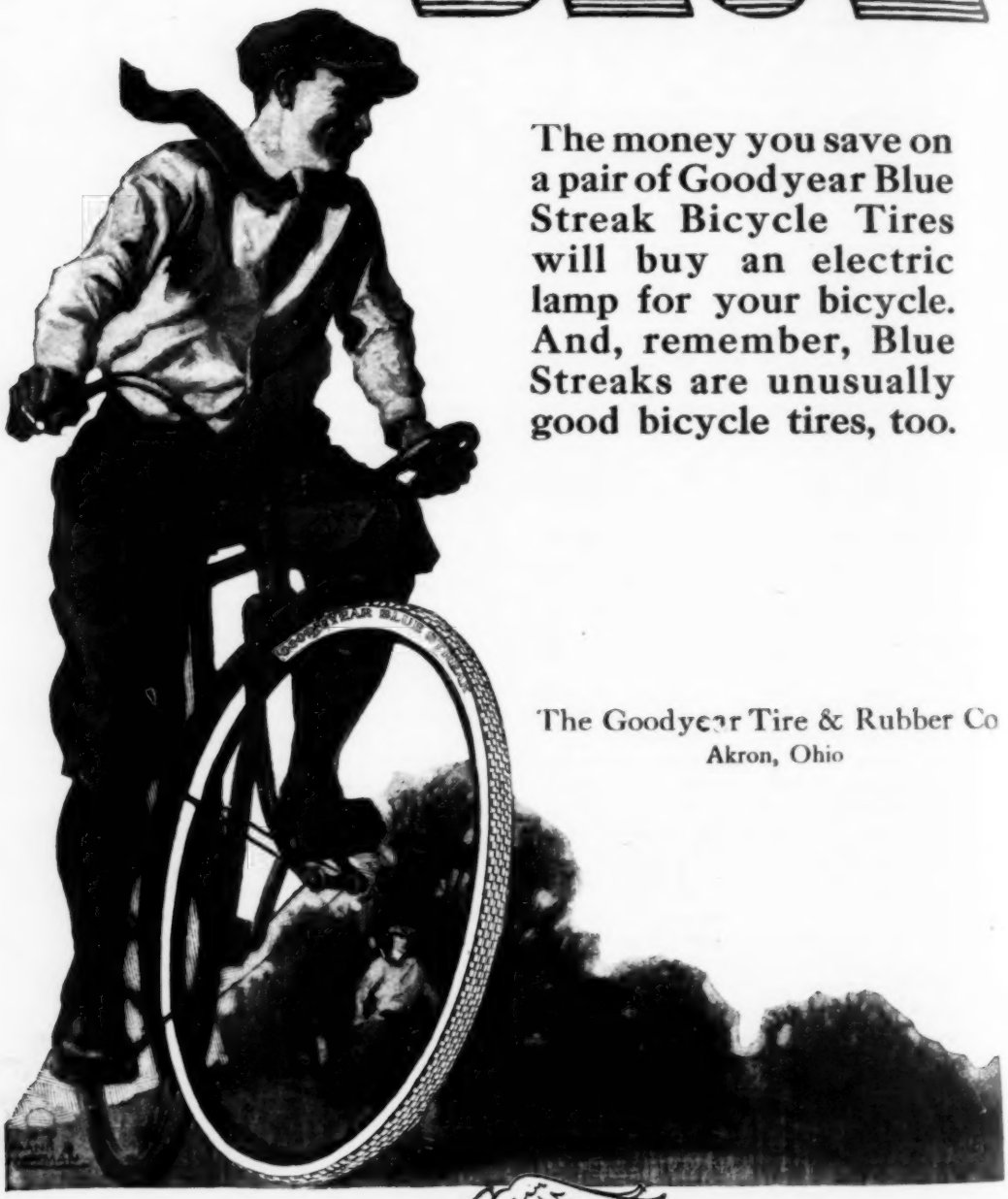
I will examine a copy of "Power of Will" at your risk. I agree to remit $3 or remail the book in 5 days.

Name..... Address.....

City..... State.....

Please Mention Popular Mechanics

BLUE



The money you save on a pair of Goodyear Blue Streak Bicycle Tires will buy an electric lamp for your bicycle. And, remember, Blue Streaks are unusually good bicycle tires, too.

The Goodyear Tire & Rubber Co
Akron, Ohio

GOODYEAR
AKRON

Please Mention Popular Mechanics

STREAKS

TRADE MARK REG. U. S. PAT. OFF.

WHY PAY MORE?

Many good bicycle tires sell for as high as $5.00 each. But Goodyear Blue Streaks cost you only $3.25 each, even in these days of high material costs.

So you may save as much as $3.50 per pair by buying Goodyear Blue Streaks. And remember, in Blue Streaks you are getting wonderful tire quality and value. That's what Goodyear's square deal bicycle tire policy means to the bicycle rider.

HOW THEY DO IT

Goodyear is able to make these big savings for you, *first*, by cutting out the extra profits which you pay on other tires. Goodyear sells *direct* to the dealer in your town and eliminates needless profits between the factory and you.

Second, Goodyear makes only one bicycle tire—the Blue Streak. By making only one tire we cut down factory costs. That's doing one thing at a time and doing it well. These savings come to you in a tire just that much better.

YOU'LL BE PROUD OF BLUE STREAKS

Goodyear Blue Streak Bicycle Tires are tires you will be proud to have on your wheel. They are handsome, durable, rugged, strong, skid-proof and easy-riding.

Goodyear Blue Streaks have tough, rugged treads with two reinforcing strips of fine fabric under the tread. This makes them long-wearing and trouble-free. The stout, two-ply tire body is laid in lively rubber, which makes the tire quick and elastic and, therefore, easy to pedal.

Blue Streaks have superior non-skid advantages. The tread is made of blocks of rugged rubber which come together and bite the ground to prevent side-slipping.

MAKE THESE SAVINGS YOURSELF

Ride around to the Goodyear dealer in your town. If you can't find him, write to us. You have a right to make these savings yourself. The money will come in very handy when prices of everything are so high. And it will please Dad. You can prove to him you're a good business man.

So look for the Blue Streaks on the tire. Be sure you get Goodyears. Then see how much better your bicycle will look. And how much easier riding it will be.

GOODYEAR

AKRON

Please Mention Popular Mechanics

These Men Are Making Big Money

So Can You!

Haywood Tire & Equipment Co.,
Indianapolis, Ind.
Gentlemen: Our vulcanizing business is becoming better and better all the time. Keep four men going. Saturday is our big day, but Friday I cleared between **$50 and $75.** The Vulcanizing game is a good one for a fellow to follow at the beginning of his business career.
Yours truly, SHEELY TIRE COMPANY,
Marshalltown, Ia.

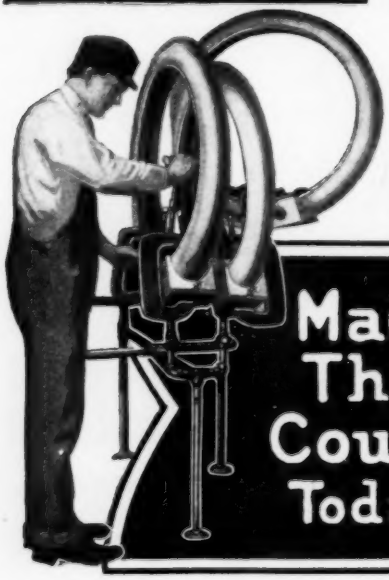
Haywood Tire & Equipment Co.,
Indianapolis, Ind.
Gentlemen: The Plant arrived here the 18th of May. On the 22nd had it in operation. Work is piling in daily. Have one man employed; expect to put on another this week. **The Haywood system is the only kind for car owners out here now.** Every job has my unconditional guarantee. The possibilities have no equal.
Yours truly, THOS. E. SCHOERNPELER,
Strathclair, Mass.

Haywood Tire & Equipment Co.,
Indianapolis, Ind.
Gentlemen: I am piled up with work and just can't begin to handle it, although I am working night and day to keep up.
Yours truly, MR. R. A. OLDHAM,
Centralia, Ill.

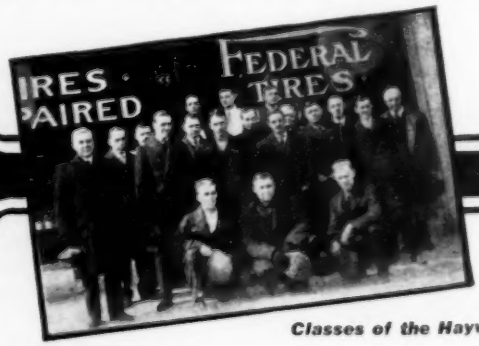
Tire Repairing Revolutionized

Motorists to Save Millions in Tire Expense

A new scientific method of Tire Repairing has been originated—the only Scientific Tire Repair Service known. It strikes a new chord in tire economy. It is done on a standard of efficiency. It saves tires—increases mileage. It lasts. It has required years of experience to develop it. Practical tests have proven it. Its excellence and superiority is acknowledged—accepted by those who know, as a **Triumph**.



Mail This Coupon Today



Classes of the Haywood

CEPTIONAL MEN! WANTED

30,000,000 Tires to Repair!

Haywood Stations are to be established at once throughout the country. We want capable, energetic, ambitious men in charge of each—men who are dependable—competent. **You can have this opportunity**—share in the Haywood success—become a link in a mammoth chain of a country-wide, thoroughly efficient Tire Repair Service.

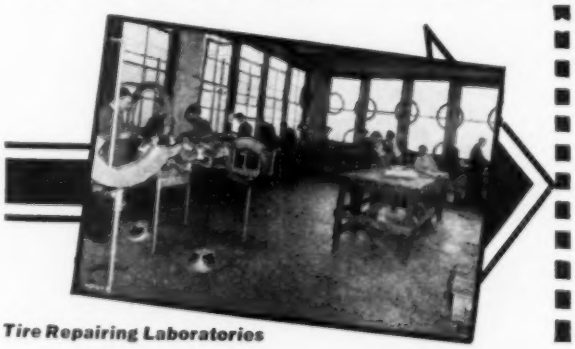
Make $3,000 a Year or Better

You Own Your Own Business—Keep Your Own Profits

Haywood equipment is sold outright. We teach you Haywood Scientific Tire Repairing in our Laboratory especially equipped for this purpose. Here you learn all about tires—the inner mechanism of construction—how to repair scientifically every tire injury. This training is thorough—practical, and equips you to give Haywood Service of the standard we advertise nationally and are so careful to maintain—the Service that saves motorists millions of dollars in tire up-keep.

A Wonderful Opportunity! The coupon below—your name and address, brings full particulars. How to start, How to tie up with the Haywood Service. We'll give inside facts and figures about costs and profits. Explain in detail our co-operative plans which mean your Success. Write today without fail. Learn how you can start at once.

Haywood Tire & Equipment Co., 1160 N. Capitol Ave., Indianapolis, Ind.



Tire Repairing Laboratories

Opportunity Coupon

Haywood Tire & Equipment Co.
1160 N. Capitol Ave., Indianapolis, Ind.

GENTLEMEN: Please send full particulars of your Scientific Tire Repair Service and details of your co-operative plans.

Name .....

Address .....

.....

Give Your Feet a Vacation This Summer

Every day is vacation day for feet incased in stylish, comfortable Keds. They are durable and modish for office wear, smart and dressy for vacation and week-end trips and easy and comfortable for after-hours recreation. Women and children love to wear them around the home, in the park, everywhere.

Keds

mean pleasing comfort for all the family. The new styles are many and varied, but in all there are the same smart, attractive features—tops of soft, flexible canvas, springy rubber soles, high or low rubber heels. Give every member of your family a pair of Keds. They'll wear longer than any shoe at anything like the price. The reputation of the largest rubber manufacturer in the world is back of every pair of Keds. Ask to see the three leading grades at your dealer's.

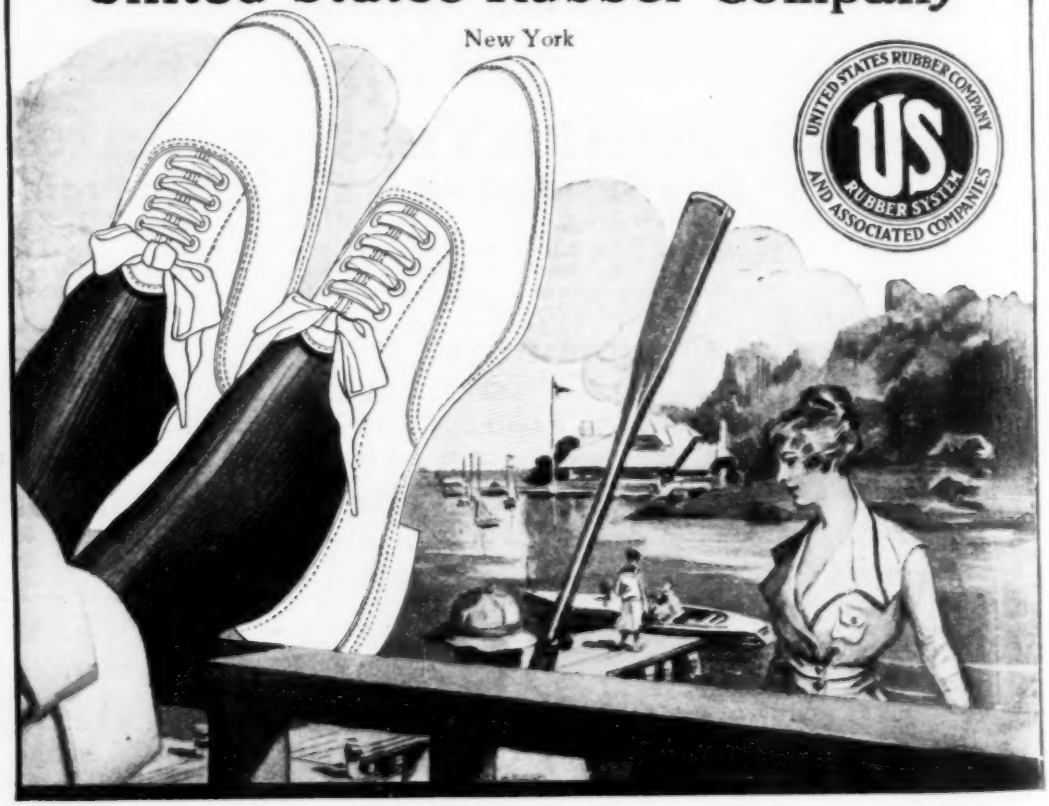
NATIONAL Keds $1.50 up

CAMPFIRE Keds $1.25 to $2.00

CHAMPION Keds $1.00 to $1.50

United States Rubber Company

New York



Bridge across the Hillsboro River—Tampa, Florida

What Goodyears Are Built to Do

The best thing an automobile tire can do for its user is to deliver him extreme mileage and exempt him from ordinary troubles.

That is precisely the service to which Goodyear Tires are built.

The various Goodyear features—the On-Air cure, the No-Hook bead, the Rubber-Rivet construction, the Braided Piano-Wire base, the All-Weather tread and the like—are pointed directly to this end.

The effort of Goodyear workmen, the goodness of Goodyear materials, the methods of Goodyear manufacture are focused in the same direction.

How well these factors combine to the results desired, may be seen in the service being delivered by Goodyear Tires everywhere, every day.

How far this service surpasses that ordinarily given, may be seen in the fact that more Goodyear Tires are sold in America than any other brand.

Goodyear Tires, Heavy Tourist Tubes and "Tire Saver" Accessories are easy to get from Goodyear Service Station Dealers everywhere.

The Goodyear Tire & Rubber Co., Akron, O.

GOODYEAR

AKRON

Gillette

The Armies of the World Use the Gillette Safety Razor

WAR is the great test of any article of utility. The soldier's kit is reduced to actual necessities.

You can't imagine a soldier carrying 'round a strop and hone.

The official Army Regulations of all Countries now call for a clean shave.

And beyond all question the Gillette is the Razor of the Great War—of all the Armies, on all Fronts.

Gillette Razors and Blades have gone abroad in a continuous stream of shipments from this Country by thousands, by hundreds of thousands and by millions!

One recent shipment was 80,000 Razors and 600,000 dozen Blades.

They've gone by Atlantic Passenger Steamers—by Freight—by International Parcels Post. By first-class registered mail and they've gone as personal baggage with passengers.

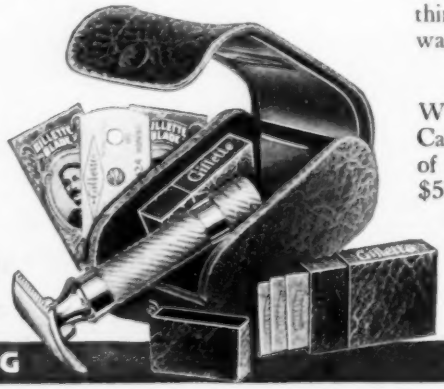
They've gone by Pacific Steamers to Japan and through Manchuria, then via the Trans-Siberian Railway to Russia.

Isn't there a lesson in this for every man in America who has not yet adopted the Gillette?

There are thousands of young men just coming to shaving age. The Gillette will help them to form good habits—the saving of small sums that count up to big ones—the habit of getting started on time—of doing a thing perfectly in the quickest way with the fewest motions.

If You Live in Canada—write the Gillette Safety Razor Company of Canada, Ltd., 73 St. Alexander St., Montreal, for Canadian Catalogue and Prices.

Milady Décollete is the dainty little Gillette used by the well-groomed woman to keep the underarm white and smooth.



Write for the New Gillette Catalogue. See the thirty styles of Gillette Safety Razors, $5 to $50. *Gillette dealers everywhere.*

GILLETTE SAFETY RAZOR COMPANY
BOSTON, U. S. A.

NO STROPPING NO HONING

Copyright U.S.A. 1917 by The B.V.D. Company
American Institutions —Baseball and B.V.D.
JUST as Baseball is the great American Game, so B.V.D. is the great American Underwear. It is made to fit the American climate, the American figure and the American idea of personal efficiency through cool comfort.
In our own modernly equipped cotton mills at Lexington, N.C., the fabric from which these Loose-Fitting B.V.D. undergarments are made, is produced in a scientific manner from selected cotton to insure durability in wash and wear.
In our own B.V.D. Factories the garments are skilfully cut, strongly stitched, accurately finished —to fit and be cool and comfortable all day long.
If it hasn't this Red Woven Label
MADE FOR THE B.V.D. BEST RETAIL TRADE
It isn't B.V.D. Underwear
(Trade Mark Reg. U. S. Pat. Off. and Foreign Countries)
B.V.D. Coat Cut Undershirts and Knee Length Drawers, 50c. the Garment. B.V.D. Closed Crotch Union Suits (Pat. U.S.A.) $1.00 the Suit.
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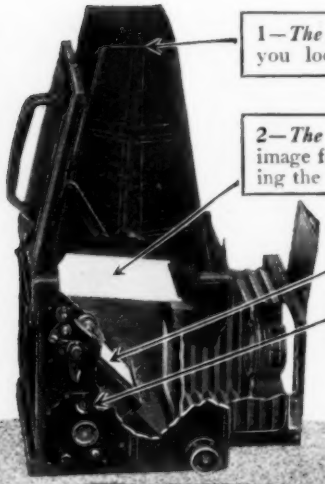
THE B.V.D. COMPANY, N.Y.



1—*The Focusing Hood* into which you look to see the picture.

2—*The Ground Glass Screen* where you watch the image full negative-size—focusing it exactly, adjusting the composition up to the instant of exposure.

3—*The Swinging Mirror* which reflects image in full negative-size onto the ground glass screen.

4—*The Focal Plane Shutter* gives not only a wide range of speeds but also FULL-timed, uniform exposure of the entire plate.

GRAFLEX Camera

HOW your lens is enabled to work at its highest speed and efficiency — how your film or plate is *uniformly* exposed, and receives the greatest volume of light during the *entire* exposure—and how the GRAFLEX makes you sure of GOOD pictures even on dull and cloudy days, is explained on pages 3 to 6 of the 64-page GRAFLEX Catalog. Ask us, or your dealer, for a Free copy.

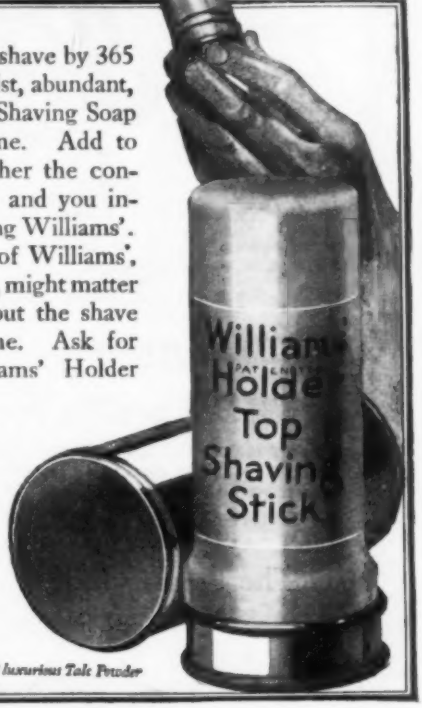
FOLMER & SCHWING DEPARTMENT
Eastman Kodak Company
Rochester, N. Y.

Williams'

PATENTED
Holder Top Shaving Stick

When you multiply the daily shave by 365 you realize what the rich, moist, abundant, soothing lather of Williams' Shaving Soap means to you in a year's time. Add to this wonderful Williams' lather the convenience of the Holder Top and you increase the importance of getting Williams'. Anything below the standard of Williams', though it be but a *shade* below, might matter little if used once or twice, but the shave is the daily duty of a lifetime. Ask for it by its full name—Williams' Holder Top Shaving Stick.

Three other forms of Williams' Shaving Soap



Williams' Shaving Soap comes in several convenient forms:

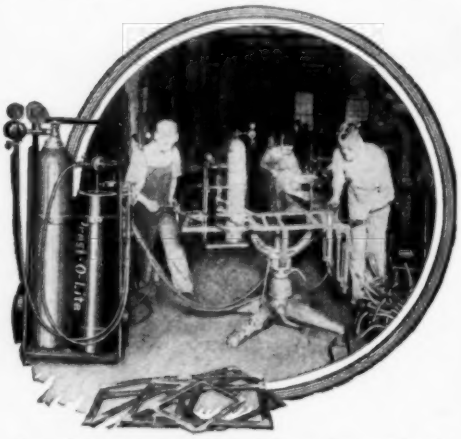
Stick, Powder, Cream, Liquid
and in round Cakes

Send 12c in stamps for a trial size of the four forms shown here. Then decide which you prefer or send 4c in stamps for any one.

The J. B. Williams Co.
Dept. A, Glastonbury, Conn.

Add the finishing touch to your shave with Williams' luxurious Talc Powder

Oxy-Acetylene Welding and Cutting



Prest-O-Lite Oxy-acetylene Process is used in the manufacture of hospital furniture by the Max Wocher Co., of Cincinnati.

Makes better, neater metal furniture at lower cost

TODAY the leading makers of all kinds of metal furniture—for offices, hospitals, homes and laboratories—employ oxy-acetylene welding instead of bolts and rivets.

By this welding process the finished product is made better, neater and stronger. Production is simplified, and other striking economies are obtained.

Oxy-acetylene welding is used as a production process by thousands of American industries—wherever two pieces of metal are to be joined it offers decided advantages. Many factories have even made radical changes in the design of their products to reap the economies of oxy-acetylene welding and increase efficiency in manufacturing methods.

In the manufacture of metal products of any kind, no matter what process you now employ, oxy-acetylene welding merits your careful investigation.

Prest-O-Lite PROCESS

Employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work, and lower cost, and also avoids the large initial outlay and heavy depreciation incurred in making crude acetylene in a carbide generator.

Necessary equipment is not expensive. We furnish high-grade welding apparatus for $75 (Canada $100); acetylene service at additional cost. Adaptable for oxy-acetylene cutting by the addition of special cutting blow-pipe. Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene—any average workman who understands metals can learn the process quickly and easily.

Our illustrated literature fully describes the oxy-acetylene welding and cutting process and shows hundreds of profitable applications. Write for it today.

Big profits for repair shops in job welding

Repair shops and service garages are making big profits and saving money for their customers by using oxy-acetylene welding to make broken or worn metal parts good as new. These profits you can realize. The cost of necessary equipment is low. The big growing demand for job welding insures continuous profits. Write today and get full details.

The Prest-O-Lite Co., Inc. U. S. Main Office Factory, 816 Speedway, Indianapolis
Canadian General Office, Dept. U. Toronto, Ontario

55 Branches and Charging Plants in Principal Industrial Centers

World's Largest Makers of Dissolved Acetylene

FAIR LIST PRICES FAIR TREATMENT

GOODRICH SILVERTOWN Cord TIRES

Patrician in Look Yeoman in Service

THOUGH you make sure *of* Silvertown Cord Tires by their Red-Double-Diamond trade mark, you can always pick them by their *Patrician* look – their generous yet symmetrical *extra-size*

Ten Silvertown Cord X-cels

1. Increased engine power.
2. Smoother riding.
3. Fuel saving.
4. Speedier.
5. Coast farther.
6. Start quicker.
7. Easier to guide.
8. Give greater mileage.
9. More resistive against puncture.
10. Repaired *easily* and *permanently*.

You *can not afford* to be without their *smarter appearance, smoother riding COMFORT and ultimate ECONOMY.*

Where You See This Sign Goodrich Tires are Stocked

GOODRICH TIRES

Ask Your Dealer for Them

The B.F.Goodrich Rubber Company, Akron, Ohio.

Also Maker of the Famous Fabric Tire Goodrich Black Safety Tread

SILVERTOWNS MAKE ALL CARS HIGH GRADE

Boys! Here's the Bug! Get It!

LAST month we asked you if you wanted a beautiful green-gold scarf-pin free. We also told you to watch for the answer here this month, 'member? Well, the answer is: Send in your full name and address, and the name and address of a bicycle dealer near you, to us and we will give you full instructions where to go to get this lovely stick-pin free. No boy who loves bicycling will want to be without one.

WRITE TODAY

United States Tire Company

1791 Broadway **NEW YORK**

MAZDA

"Not the name of a thing, but the mark of a service"

As the turbines draw from Niagara the energy that sets the motors whirling—so MAZDA Service draws from the flood of new thoughts in lighting, the ideas that help the lamp-makers make better lamps.

4630

The Meaning of MAZDA

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this Service. MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA Service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.

RESEARCH LABORATORIES OF THE GENERAL ELECTRIC COMPANY

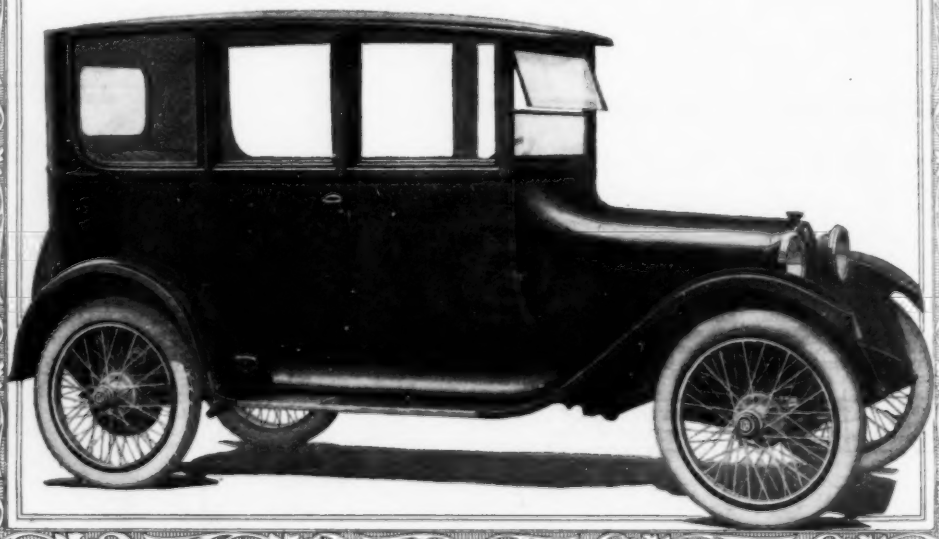
DODGE BROTHERS
CLOSED CAR

The varied uses to which the convertible sedan may be put make an especial appeal to women

For shopping, for touring, for social functions—it is always ready the whole year 'round

Touring Car or Roadster, $835. In Canada, $1185
Winter Touring Car or Roadster, $1000. In Canada, $1420
Sedan or Coupe, $1265. In Canada, $1800
All prices f. o. b. Detroit

DODGE BROTHERS, DETROIT



Please Mention Popular Mechanics

South Bend

■ ■ ■

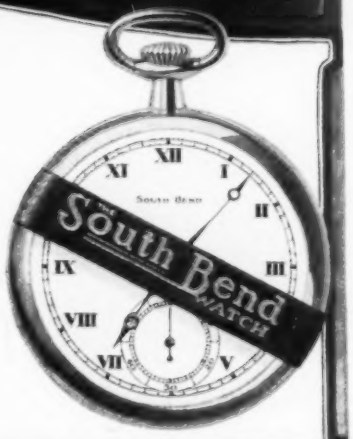
At Graduation Time

Surprise and delight him with a South Bend Watch. He will prize it instantly for its trim, stylish beauty, and will always treasure its unfailing accuracy.

Throughout his lifetime it will serve him faithfully and be a constant reminder of the taste and regard of the giver.

Made in many stylish models for men and women, at from $16 to $125. The new 19-jewel watch at $28.75 gives you value you cannot duplicate in other makes without paying a higher price.

At your jeweler's; distinguished by the South Bend Purple Ribbon of Quality. Send for our interesting booklet.



SOUTH BEND WATCH COMPANY, 26 Studebaker St., South Bend, Ind.

Where a slip means ruin!

Big hoists that lift a hundred-ton load with ease and precision are controlled by brakes that must not slip, crush or burn. The motorist, too, knows that a safe brake band is the best protection to his life and his car. And both the giant hoist and the motor-car have brakes lined with

JOHNS-MANVILLE Asbestos

Resistant to heat, water, wear and weather

JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

TO MANY FIELDS, in many forms, this wonderful substance brings safety—roofings that resist fire and time, and wrappings for electric wires—theatre curtains and flame-proof clothing. Fashioned from natural rock, J-M Asbestos today serves man in countless homes and industries. The list of J-M Products below is but an outline, but it tells the story. Asbestos in useful form—this is Johns-Manville's achievement.

H. W. JOHNS-MANVILLE COMPANY
New York City
Branches in 54 Large Cities

Asbestos Fabrics, Packings, Roofings, Shingles, Brake Linings, Building Materials, Electrical Devices, Heat Insulations, Refractory Cements, Waterproofing.

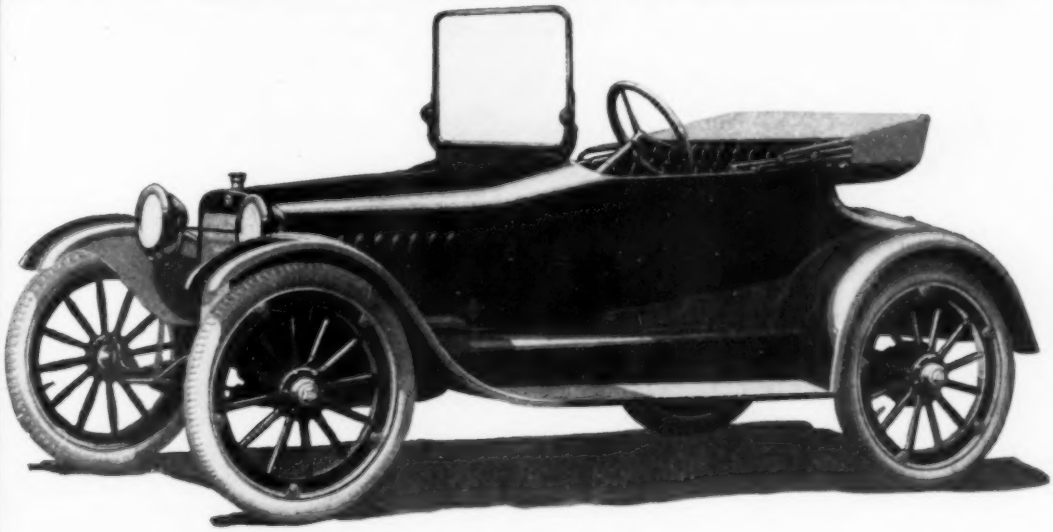
The Motor Car | The Farm | The Home | Industry | Power Plants | Transportation | Roofings

When you think of Asbestos you think of Johns-Manville

Please Mention Popular Mechanics

SAXON ROADSTER

A CAR COMPLETELY EQUIPPED WITH EVERY MODERN FEATURE



Read these reports from owners as to the service this car gives

"As for my Saxon Roadster—show me a car that can beat it. I can out-run and out-climb anything from a (***higher priced car***) down the line. Recently I persuaded (***another low priced car***) to race me by giving him a half mile handicap. The result was to put the (***other car***) in the ditch and my Saxon Roadster a half mile in the lead. I can throttle down to 2 miles per hour on high or speed up to over 50, and can prove it any day. I average 32½ miles to the gallon of gasoline and 125 miles to the quart of oil. This new series Saxon Roadster is certainly a 'bear.' For power, speed and endurance it cannot be beat."—F. P. PORT, Owosso, Okla.

200 miles for $1.32

"I have owned and driven my Saxon Roadster for two years. Repair bills have been practically negligible, it has never failed to give me thoroughly fine service. I have found it an absolutely dependable car. One trip I made this spring of 200 miles, over bad, winter-roughened roads, on 6 gallons of gasoline. Paid 22c per gallon—so the total cost of that trip was $1.32, or considerably less than a cent per mile. Another trip I made recently was for 165 miles—over slightly better roads. I used but 4¾ gallons of gasoline, by actual measurement. Your Saxon Roadster is not only a wonderful performer, but it is a wonderfully economical car."—RAY LESSIG (Address on request.)

Resists hardest road abuse

"My Saxon car has always been faithful and dependable. I have driven it every day this winter, over roads that were deeply rutted and frozen as hard as iron, and the way it has stood up under all kinds of abuse is truly wonderful One would naturally think any car would begin to squeak and rattle after such treatment, but my Saxon Roadster runs just as smoothly and silently as when I first got behind the wheel. In my judgment it has made a wonderful record, and you can be sure that my name will continue to be on the list of Saxon owners."—G. W. HUGHES, Armstrong, Ill.

Costs less than $1 a week

"I wish to put myself on record as to the advantages of using a Saxon Roadster. I have made so many successful trips in this car, at such low cost, that I feel that I cannot too highly recommend this car for the use of other ministers. I drive my car every day—looking after a large pastorate—besides attending weddings, etc., and my actual running expense is less than $1.00 a week. For a minister, or for any man who wants lots of service with rare trouble and little expense, I know of no car better than a Saxon Roadster."—REV. F. Z. BURKETTER, Greensburg, Ind.

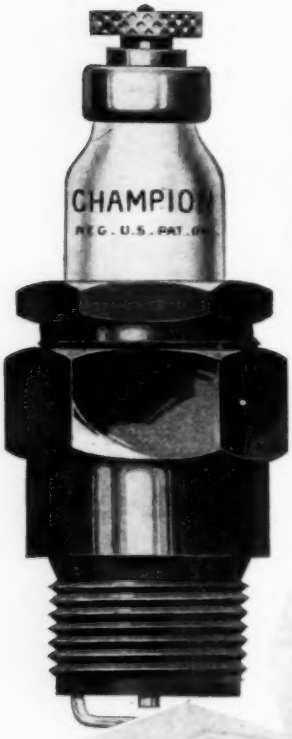
The Saxon Roadster is $495; Saxon "Six" Touring Car, $935; Six Sedan, $1250, f. o. b. Detroit. Canadian Prices—Six Cylinder Touring Car, $1260; Touring Sedan, $1725; Four-Cylinder Roadster, $665. Price of special export models, "Six," $950; Four, $515; f. o. b. Detroit.

(10)

SAXON MOTOR CAR CORPORATION, DETROIT

Champion Toledo

Dependable Spark Plugs



"HAND me that plug please—I want to see if it says 'Champion' on the porcelain.

"Hereafter when you buy plugs, make sure that they always have 'Champion' on the *porcelain* as well as on the box."

An inferior plug can completely handicap the performance of a costly machine—while Champion spark plugs make *any* priced car perform better.

There is no excuse for not getting maximum service from your motor, not if the plugs you buy say "Champion" on the porcelain.

The *number* of cylinders is not as important as the *results* obtained from them. "Champion" spark plugs insure the desired results.

There is a Champion Spark Plug especially designed for every type of motor car, motorcycle, marine and stationary engine.

Champion Spark Plug Co.
417 Upton Ave. TOLEDO, OHIO

It Does the Work the Easy Way

There are no intricacies—it is a matter of seconds to make pictures with a Premo Film Pack camera, even without previous experience.

The illustration shows how easily and quickly the camera may be loaded or unloaded. Just open the back in any light and drop in the unexposed pack or lift out the exposed one. To make the exposures, locate the subject in finder, snap the shutter, and pull out from top of pack a black tab. That's all there is to it. This operation is simply repeated until the entire pack is exposed.

Film pack film is from the same stock as the Eastman N. C. films—an assurance of highest quality. It offers you the advantage of tank development and the unique feature of removing one or more films for development at any time, without waiting until the complete pack is exposed. Its thin, flat form and its simple principle have made possible the manufacture of unusually light, compact and inexpensive cameras, one of which is the

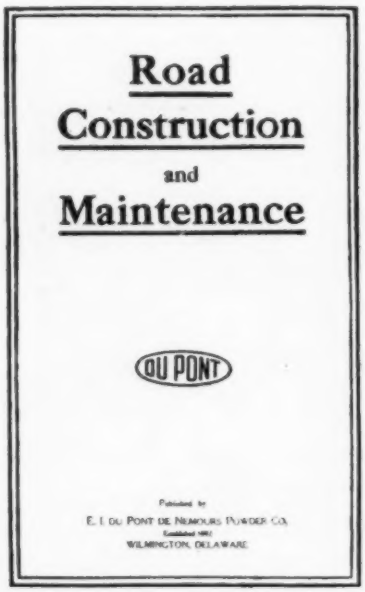
PREMOETTE JR.

Just a trifle larger than the pictures it makes, yet capable of as good results as those obtainable with the largest cameras.

Made of aluminum, covered with genuine leather, and fitted with Kodak Ball Bearing shutter and a choice of selected lenses, tested in the thorough Eastman way. Prices $5.00 to $14.00. Pictures 2¼ x 3¼ and 2½ x 4¼.

The new Premo Catalogue describes in detail a complete line of film pack, plate and cartridge film Premos and accessories. It's free at your dealer's, or will be sent by us postpaid on request.

Rochester Optical Department, ***Eastman Kodak Company,*** **Rochester, N. Y.**



Save Road Building Labor and Time

GOOD roads are imperative—vital. They deal with your personal welfare and the progress—the stability—the safety of the Nation. Road construction requires labor. Labor is scarce. Something must be done. This book tells how. It covers in a complete and practical way all of the latest road building methods. It explains the use of all up-to-date road building machinery. It tells how to speed up road work, economize in time, and cut down manual labor. It covers every phase of road building from choice of location down to the finished road.

It is written in a plainly understandable style, is profusely illustrated and is now being used as a text book in many colleges and universities.

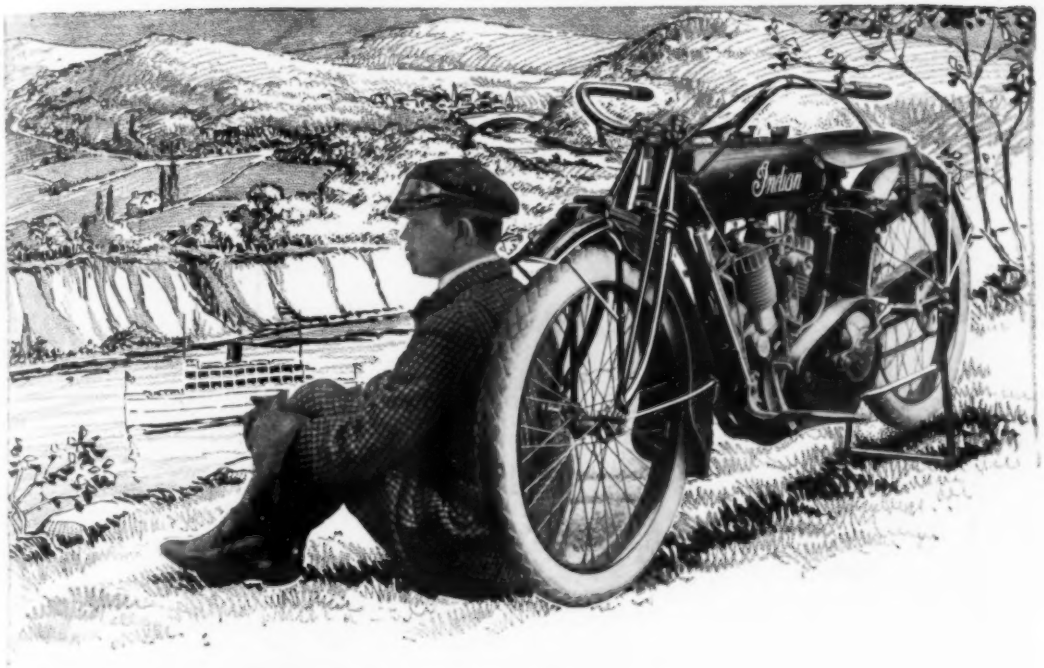
Get this Big Book Free

Send today for your copy of

Good Roads Book No. 248

E. I. du Pont de Nemours & Company

Wilmington, Delaware



Here It Is, Almost June!

The motorcycle riding season is in full swing. The arteries of the nation are thickly dotted with Indians. Every road's an Indian road. Your veins are filled with wanderlust. You're asking yourself *why* you've delayed buying your 1917

Indian Motocycle
With Powerplus Motor

Will another holiday or Sunday go by without an Indian? That red blood in your system, that love of the open which is every man's heritage, tells you *decidedly no.*

Way over a hundred thousand Indian riders have had *your* experience. They, too, found *Indian-ing* couldn't long be resisted.

Let us send you the standard Motorcycle Text Book—the 1917 Indian Catalog.

Makers also of the 1917 Indian Light Twin Motocycle, Side Car, Electrically Equipped Bicycle and ten other model Bicycles.

HENDEE MANUFACTURING CO., 710 State Street, Springfield, Mass.

(Largest Motorcycle Manufacturers in the World)

IVER JOHNSON

Safety Automatic **REVOLVER**

"I'll take this one—

I'm going to give my family *real* protection. No trifling with burglars in my home."

FOR years I have carried insurance on my life and home and jollied myself into thinking that this was all the protection any husband and father *could* throw around his family.

"Last night a burglar broke into my neighbor's house. IF Reynolds had only had a revolver he—

"That was enough for me! No temporizing with burglars in my home. I'm for *real* protection. I'll take this revolver I have in my hand, Mr. Clerk."

Are you ready—when the time comes—to do *your* duty by your burglar? Will you master him or will he master you? Will you give your family protection that is one jot short of *real, full, complete* protection?

When you buy a revolver buy a *good* one. The Iver Johnson is the safest small firearm made. It is proof against accidental discharge. You can "Hammer the Hammer."

Hammer model with Regular grip $6.75. Hammerless model with Regular grip $7.50. Both models also made with "Perfect" Rubber or "Western" Walnut grip. Send for Free Arms Book—"A."

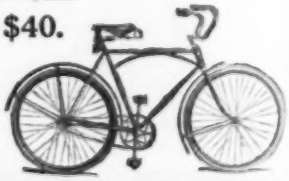
Iver Johnson Bicycles can't be beat for speed, easy riding, strength and long wearing qualities. Racing, Cushion Frame, Truss Frame Roadsters and Mobicycle models. $35 to $55. Juveniles, $20 to $25. Send for

THREE BOOKS FREE

Indicate which books you want: **A**—"Arms," **B**—"Bicycles," **C**—"Motorcycles."

IVER JOHNSON'S
ARMS & CYCLE WORKS
307 River Street Fitchburg, Mass.
99 Chambers Street, New York
717 Market Street, San Francisco

$40.



A Watch that the People Want

Waterbury
$3

Illustrations
11/16 actual size

Waterbury
Radiolite
$4

The New *Ingersoll* Waterbury

IN the first place it's the size that is so much wanted today —especially in the cities—the smaller "12-size".

Stylish in Appearance

Then the whole "get-up" of the watch is smart, stylish, up-to-the-minute in all the little features found in the high-priced watches. Notice the gracefully shaped bow and crown, and the distinctive figures on the dial. An attraction that doesn't show in the illustration is the enamel dial.

Accurate and Sturdy

But a watch is to keep time and meet practical requirements. Here is three dollars' worth of watch by the best Ingersoll standards. It's jeweled with four jewels at points of greatest friction. It is accurate; yet it is sturdy too. It isn't put out of business by a little rough handling that most watches won't stand.

The Waterbury "Radiolite"

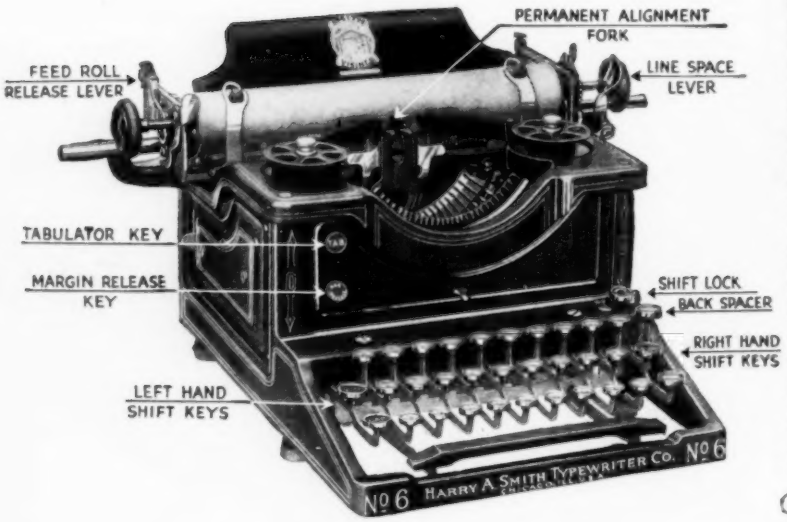
As an added attraction you have the Waterbury "Radiolite". Since the stem wind was invented there has been no greater innovation in watches than the "Radiolite" feature. The hands and figures are made of a new self-luminous substance containing genuine radium.

The power of radium is practically permanent, and the other twelve minerals of the substance on which it acts will respond in a brilliant glow for years and years—we'll say ten years to be conservative.

Let the Dealer Show You

The dealer has both these Waterbury models, which he'll be glad to show you. You can nearly always tell an Ingersoll store by the display of Ingersolls in the window. If the dealer hasn't the model you want, it will be sent on receipt of price by any of the offices named below.

ROBT. H. INGERSOLL & BRO. New York Chicago San Francisco



I want, through this advertisement, to establish as friendly business relations with you as I possibly can. I want you to realize also that it is my earnest effort and intention to give you full honest value for every dollar that you spend with me. This is the only way I can succeed. My advertisement has appeared in this magazine continuously for more than four years.

I am building up my business on the foundation of good value and square dealings. I am saving thousands of satisfied customers thousands of dollars, by supplying perfect—late style—visible writing—typewriters, at remarkably low prices.

All my transactions are handled throughout by personal correspondence. I assure you every courtesy and consideration in your dealings with me. Your order will have my prompt, careful, personal attention. I will be glad to do business with you.

Harry A Smith

TYPEWRITER SENSATION

Free TRIAL—Use As You Pay

Send me only $2.00 a month until the low total price of $34.15 is paid, and the machine is yours

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay $2.00 a month and own one. Think of it — Buying a $100.00 model for $34.15. Cash price, $32.30. Never before has anything like this been attempted.

Standard Visible MODEL No. 6

Perfect machines, Standard Size, Keyboard of Standard Universal arrangement, writing 84 characters—universally used in teaching the touch system. **The entire line of writing completely visible at all times,** has the tabulator, the back spacer; in fact, every late style feature and modern operating convenience. Comes to you with everything complete, tools, cover, operating book and instructions, ribbon, practice paper—nothing extra to buy. **You cannot imagine the perfection of this beautiful reconstructed typewriter until you have seen it.** I have a thousand of these perfect latest style Model No. 6 typewriters at this bargain price, and each purchaser fortunate enough to secure one of these beautiful machines must try it out in home or office for five days before deciding to buy. I will send it to you F. O. B. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter bargain you ever saw, you can return it at my expense. You won't want to return it after you try it — **you cannot equal this wonderful value anywhere.**

H. A. SMITH
Room 510-231 N. Fifth Ave.
CHICAGO, ILL.

Ship me a No. 6 Smith F. O. B. Chicago, as described in this advertisement. I will pay you the $28.00 balance of the SPECIAL $34.15 purchase price, at the rate of $2.00 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

Name .....

Address .....

.....Pop. Mech. June

You Take No Risk—Put In Your Order *Now*

When the typewriter arrives deposit with the express agent $6.15 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me $2.00 a month until my bargain price of $34.15 is paid. If you don't want it, return it to the express agent, receive your $6.15 and return the machine to me. I will pay the return express charges. **This machine is guaranteed just as if you paid $100.00 for it.** It is standard. Thousands and thousands of people own and use these typewriters and find them the best ever manufactured.

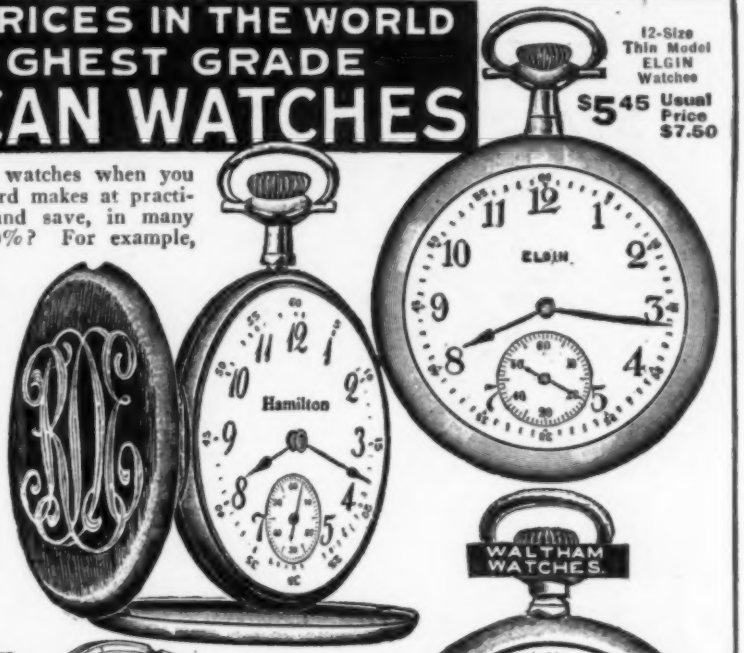
The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today—mail to me—the typewriter will be shipped promptly. There is no red tape. I employ no solicitors—no collectors—no chattel mortgage. It is simply understood that I retain title to the machine until the full $34.15 is paid. **You cannot lose. It is the greatest typewriter opportunity you will ever have. Do not send me one cent. Get the coupon in the mails today — sure.**

HARRY A. SMITH, 510-231 N. Fifth Ave., Chicago

LOWEST PRICES IN THE WORLD FOR HIGHEST GRADE AMERICAN WATCHES

12-Size Thin Model ELGIN Watches $5.45 Usual Price $7.50

Why pay retail prices for watches when you can buy the world's standard makes at practically the *wholesale* cost and save, in many instances, approximately 40%? For example, a 16 Size Hamilton No. 974—17 Jewel Adjusted Watch complete in 25 year gold filled case, sells at retail for $21.00 to $25.00—this very same watch can be bought direct from us at the **wholesale cash price of only $14.50!** Think of that! Get our beautiful 226-page catalog just off the press, and you will be utterly amazed at the way we undersell all others in the United States. In this great book you will see all the world's most famous watches illustrated and described—Elgin, Waltham, Hamilton, Illinois, etc., etc. Page after page opens before you with such positively sensational values that there will be no question in your mind of our being the lowest-priced distributors in the country.



FREE Examination

See It Before You Pay For It!

So as to absolutely convince you that you are getting exactly what you order, and that the big value you get is true in every respect, we will gladly send you a selection at *our expense*, to any bank or express, and let you *see it before you pay a penny*. Write today for our 226-page catalog. It is the greatest authority on watches ever published. And it is *free for the asking*.

Big Catalog Free

Hamilton Watches at lowest prices in the world

18-Size No. 924—17 Jewel Solid Nickel $8.98

16-Size, No. 974—17 Jewel 25 Year Gold Filled $14.50

16-Size, No. 992—21 Jewel 25 Year Gold Filled $26.80

Engraving Free

7 JEWEL ELGIN OR WALTHAM 20 Year Gold Filled Watches All Sizes $6.66 $10 Value

Gentlemen's Octagon New Style 25 Year Gold Filled 12 Size Watches

15 Jewel	$10.50
17 Jewel	$12.35
21 Jewel	$15.00

Elgin or Waltham Ladies' Watch Bracelets, 20 Year Gold Filled.

7 Jewel	$8.98
15 Jewel	$11.65
17 Jewel	$16.98

Extra Special

14 KARAT SOLID GOLD

23 Jewel $11.75 $20 Value

17 Jewel $9.75 $18 Value

7 Jewel $7.75 $14 Value

10 KARAT GOLD FILLED

21 Jewel $4.75 $8 Value

15 Jewel $3.98 $7 Value

7 Jewel $2.75 Value $5

10 Year Free Repair Guarantee Bond Given With Every Watch.

15 Jewel Octagon $10.50

I. PRESS & SONS

IMPORTERS AND CUTTERS OF DIAMONDS
WHOLESALE JEWELERS
862 CHESTNUT ST.
PHILADELPHIA, PA.

WHITE HOUSE

BRAND

COFFEE *And* TEAS

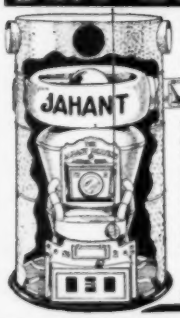
In our campaign for a *"Better Cup of Coffee"* we need the assistance of the intelligent housewife to the end that the *splendid material* furnished by us under the name of "White House" be not spoiled in the brewing.

The WHITE HOUSE COFFEE is sold in the bean, ground or pulverized, and *never* in any package but the *one, two, or three-pound ALL-TIN cans.* White House *TEA,* quarter and half-pound *ALL-TIN cans, all varieties,* just as good as White House Coffee.

DWINELL-WRIGHT CO.

Principal Coffee Roasters BOSTON—CHICAGO

Save $20 to $50 on COAL BILL



Save $20 to $50 on winter coal bill with a New Scientific Down Draft Jahant Furnace. Lasts a lifetime. Heats every room evenly. Burns oxygen, saves coal. Burns coal to fine ash. Heats quickly in morning.

WE PAY THE FREIGHT

We pay freight anywhere in U. S. or Canada. Price includes entire equipment cut to fit. Easily installed.

Sold on Monthly Payments

Buy a Jahant now, a payment down, rest easy monthly payments. It will pay for itself in short time. Sold on 360 day Money-back, Legal Guaranty Bond. Engineers' advice FREE.

FREE! Complete set of erecting tools Free with each Jahant. Get book, "WHAT USERS SAY," and literature, all free.

JAHANT HEATING CO.

26 Jahant Bldg., AKRON, OHIO, U.S.A.

See October and December Popular Mechanics for advertising of

The Pullman Company

Let Me Quote You a Special Price On My *Rapid* FIRELESS COOKER

Cook every meal on it. If you are not satisfied and delighted I will refund every cent. Get my

Special Low Factory Price

direct to you. Cooker is aluminum lined throughout. Full set of famous "Wear Ever" aluminum cooking utensils comes with it. Ask for free book of valuable recipes.

WILLIAM CAMPBELL CO.

Dept. 64 DETROIT, MICH.

Let Me Keep Your Ice for 30 Days

I'll Save You ½ of It

Let me put a White Frost Refrigerator in your home on 30 days' trial. **I'll pay the freight.** Write and get my catalog. I sell the only round, white enameled refrigerator on earth. Made of zinc coated steel, soldered air-tight. Lasts a lifetime. Insulated with granulated cork. Noiseless doors and covers. Revolving shelves—nickel trimmings. Move-easy casters. Improved crystal glass water cooler with removable top. Write for catalog and factory-to-you price. Cash or easy payments. Yours truly, H. L. SMITH, Pres.

White Frost SANITARY Refrigerator

White Frost Refrigerator Co., 679 N. Mechanic St., Jackson, Mich.

Highest Grade UNDERWOOD

With Back Spacer—Two-Color Ribbon and Tabulator FOR

You Try It 10 Days Free

Guaranteed for Five Years

Think What You Can Get Now for $39.96

A genuine No. 4 Underwood—the standard visible typewriter, with back spacer, two-color ribbon and tabulator—*complete* with waterproof cover, new ribbon and special touch typewriting instruction book—the machine that is today the leading typewriter of the world! *Guaranteed* to be delivered in perfect condition! Fully guaranteed for five years.

$39.96

You May RENT APPLYING RENT ON PURCHASE PRICE

OR

BUY FOR CASH OR ON EASY PAYMENTS

'Way Under ½ Manufacturer's Price

Read This Letter And Then Write Us for NEW Offer

Grand Rapids, Mich.,
March 5, 1917

The Underwood No. 4 Typewriter you sent me, was received promptly, and to say I was highly pleased with it is only putting it mildly. I have spent about five years in New York and other Eastern cities as stenographer, and have used nearly every type of modern machines. In view of the fact I think I can lay claim to be a reasonably accurate judge of a typewriter, and I want to say that the machine you sent me is first class in every respect. It has been thoroughly rebuilt and it works and looks like a brand new machine.

Very truly yours,
(Signed) R. H. Pousma

Moreover, you don't have to buy it to try it! We will send one to you on Ten Days' Trial. Write all you please on it for ten days and then if you are not *perfectly* satisfied, send it back at *our expense*. What's more, if you do not care to buy, you may rent it at our low monthly rates. If later you want to own it, we will apply *six months'* rental payments on the low purchase price. Any national bank in Chicago, or any Dun's or Bradstreet's Agency anywhere will tell you that we are responsible. Learn *all* the facts about this remarkable offer. Write us today—send us your name and address on the attached coupon—or a post card. Ask for Offer No. 52.

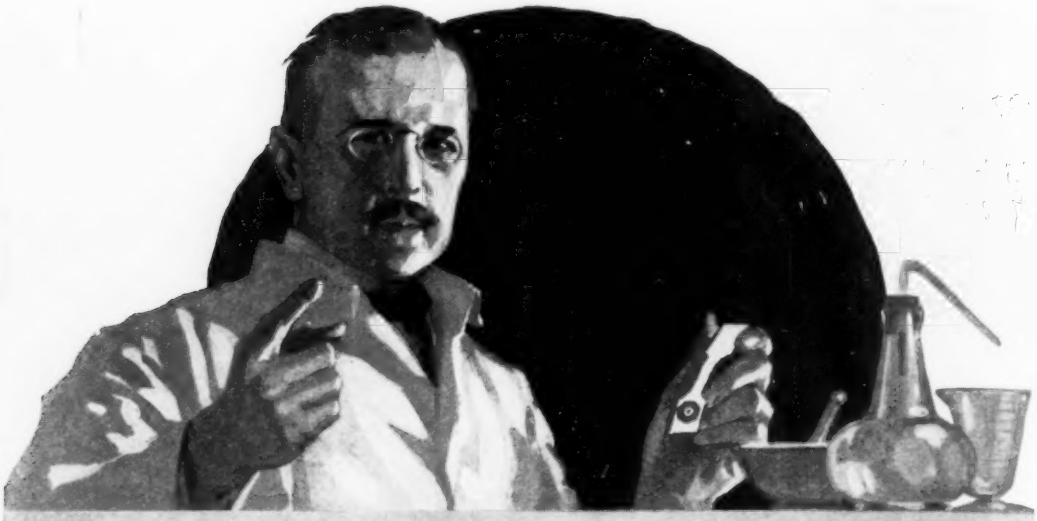
Write tonight—send your name and address on the coupon or a post card and learn all about Offer No. 52.

Write for our agency proposition.

Typewriter Emporium, 34-36 W. Lake Street, Chicago, Illinois
Send me *immediately* full facts about your Offer No. 52.

Name _____
St. or R.R. No. _____
City _____
State _____

Typewriter Emporium, 34-36 W. Lake St., Chicago
Established for a Quarter of a Century



The Truth About Corns

You have read much fiction about corns. Were that not so there would be no corns. All people would use Blue-jay.

Here is the truth, as stated by a chemist who spent 25 years on this corn problem. And as proved already on almost a billion corns.

"This invention—Blue-jay—makes corn troubles needless. It stops the pain instantly, and stops it forever. In 48 hours the whole corn disappears, save in rare cases which take a little longer."

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Tobacco Redeemer contains no habit-forming drugs of any kind and is the most marvelously quick, absolutely scientific and thoroughly reliable remedy for the tobacco habit.

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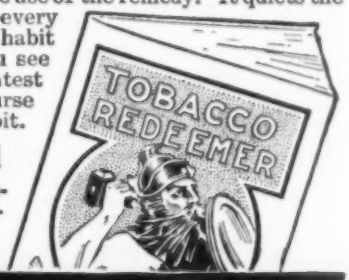

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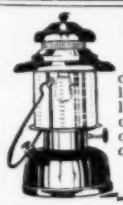

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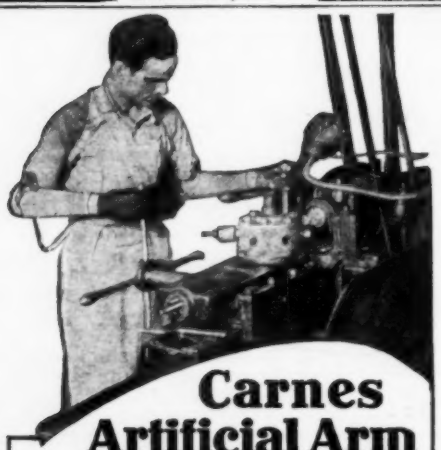

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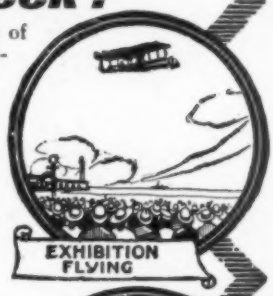

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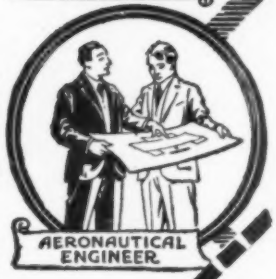

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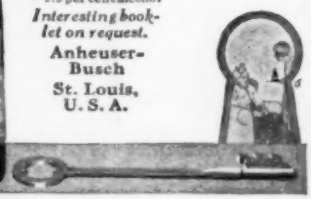

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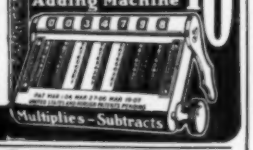

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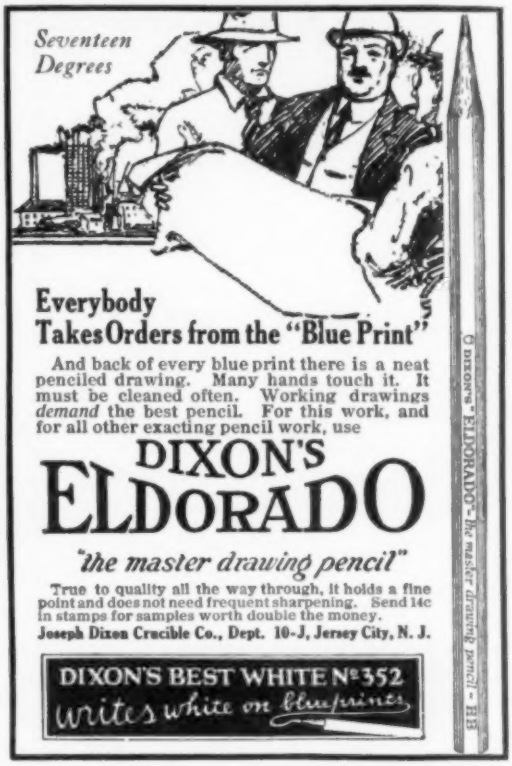

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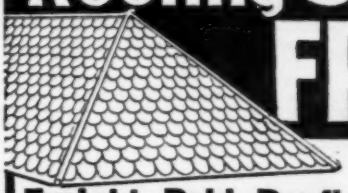

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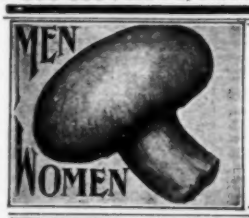

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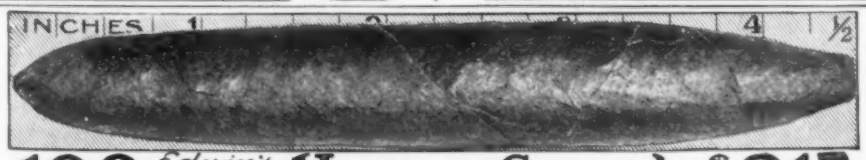

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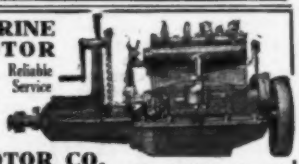

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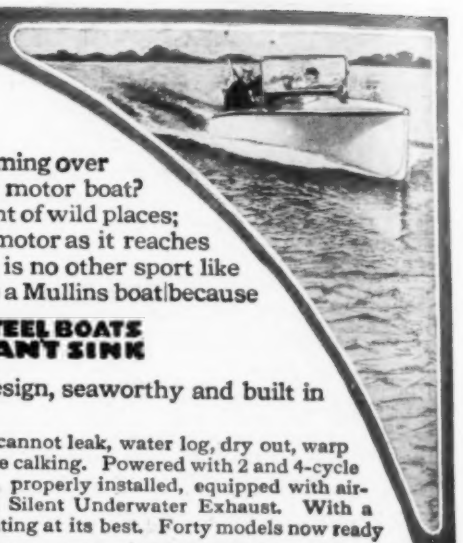

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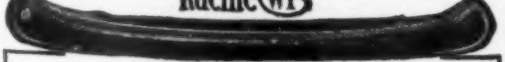

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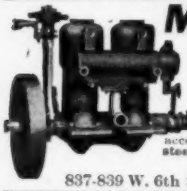

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3 H. P. single cylinder . . . 45 lbs.
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Are light, at the same time strong, accomplished by using semi-steel castings, high carbon steel shaft, bronze bearings, high class workmanship.

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In the field, on the stream, or in the home

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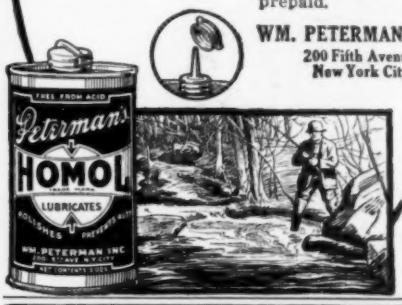

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Any appliance is a truss. Ruptured people must wear a support. Our New Sponge Rubber Pad (pat'd) is velvety, soft to the skin, pliable, **cannot slip,** extremely comfortable, adapts itself to ruptured parts with less pressure, is sanitary, long lived. Massages and strengthens muscles, allows blood circulation and **produces many cures.**

39 STYLES OF TRUSSES
23 DIFFERENT PADS

Scrotal Pad Needs No Leg Strap

Our New Akron Sponge Rubber Scrotal Pad (pat'd) holds 8 out of 10 cases of scrotal hernia perfectly without strap between the legs.

Cures Man of 86

The Akron Truss Co. Gentlemen: I am 86 years and 6 months old and have had a rupture for 27 years. I am an active man, tend to a large garden, saw and split the wood and do the household chores. I bought an Akron Truss and wore it one year and am as sound as a dollar.
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The Akron Truss Co. Gentlemen: I have worn one of your trusses for some time. All this time have carried two heavy sample cases; notwithstanding this handicap, your truss has cured me of a double hernia.
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Combination machines for threading straight and bent pipe, nipples and bolts.

No. 300B—½ to 2" pipe 7/16" to 1¼" bolts.

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Note patented quick-opening die-head with cutting edges in plain sight of operator.

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Made in 4 size combinations up to 8" pipe, either drive.

Please send *"Actual P.-T. Experiences"* and catalog (free)

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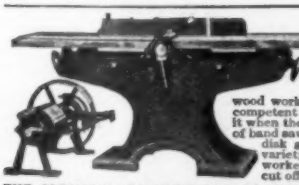
HERRINGS AS BAROMETERS—New experiments have brought investigators to the conclusion that certain fishes are guided in their migrations by highly developed senses of smell and touch. The fishes, Popular Science Siftings says, recognize the presence of slight traces of acids and alkalies, and herrings prove sensitive to changes of a fraction of a degree in temperature. It is also concluded that salmon find their way from far at sea to their chosen rivers by some chemical peculiarity of the water.



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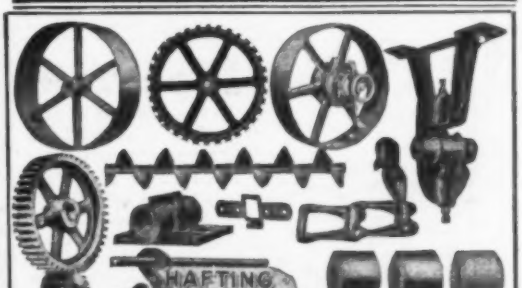

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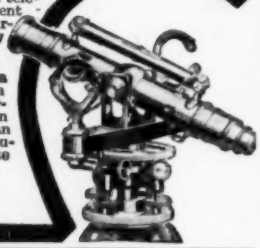

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Money Spent for Good Tools Is an Investment, Not an Expense

They will work more faithfully for you under all conditions, stand harder wear and outlast other tools if you will specify

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A complete line of Pliers, Screwdrivers, Snips, Glass Cutters, Hack Saws, etc. You will consider their ownership the best investment.

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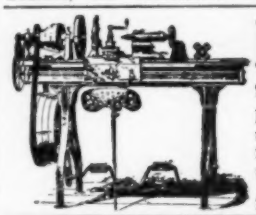

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9 to 18-inch Swing

List price $75 and up according to size. When ready to buy send for Lathe Catalog and prices.

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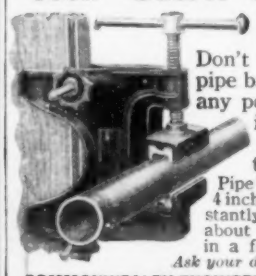
CARRY YOUR **Claw Pipe Vise** to the job and attach it INSTANTLY.



Don't waste time carrying pipe back to a bench. Fits any post, round or square, iron or wood, door or window casing. Fastens absolutely rigid. Pipe simply cannot slip in the 4 inch teeth. Reverse jaws instantly for small pipe. Weight about 25 lbs. Pays for itself in a few weeks. Price $15.75.

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Use Water Power for Hard Work $2.50 UP

The Divine Red Devil Water Motor

will operate washing machines, sewing machines, small lathes, small dynamos, do grinding and polishing. No muss—no fuss—nothing to get out of order.

A Simple, Durable, Economical Motor

that costs little or nothing to operate. Improved bucket-wheel construction exactly like big turbines. Power for small shops, mechanics, grocers, doctors and dentists. Money back if not entirely satisfied.

Booklet and Prices Sent Free if you will write today and give us size of faucet, water pipe and water pressure and work to be done. You must furnish information to get booklet.

Agents Wanted

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The Automatic Feed Saves Drills

Every mechanic—whether machinist, plumber, metal worker or garage man—needs this No. 1500 "Yankee" Chain Drill, with Automatic Friction-and-Ratchet Feed. Friction feed tightens chain and quickly brings drill point to the work, or as speedily draws drill from hole after job is finished. Shift the lever and the Automatic Ratchet feed maintains a uniform pressure as the drill bites through the work. The workman pays no attention thereafter to the feeding as it is automatically, uniformly and exactly adjusted for all drills from smallest up to ½ inch in diameter. You save drill points with this chain drill; and work speedily and accurately.

Your Dealer Can Supply You

Write for "Yankee" Tool Book," illustrating and describing the various styles of "Yankee" metal- and wood-boring, and screw-driving tools.

North Bros. Mfg. Co., Philadelphia, U. S. A.

"YANKEE" Chain Drill No. 1500

The "Yankee" Chain Drill comes in two styles:

No. 500—2-jaw chuck
Length, 10¾ in.
Weight, 3½ lbs.
Holds square shank drills up to ½ in. diameter.

No. 1500—3-jaw chuck
Length, 9¾ in.
Weight, 3¼ lbs.
Price $3.90
Chuck holds round shank drills up to ½ in. diameter, has tool steel jaws specially hardened. Square thread, steel feed screw.

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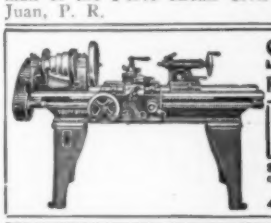

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with 3-in-One Oil. It will make door hinges work noiselessly. For longer wear and easier work use 3-in-One on your:

Sewing machine, typewriter, talking machine, ice cream freezer, bicycle, skates, music box, lawn mower, cream separators, clocks, locks, hinges, bolts, catches, pulleys, scales, scissors, and everything else ***around your home*** that ever needs oiling.

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3-in-One also cleans and polishes all wood and metal surfaces—absolutely prevents rust and tarnish, indoors and out.

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One Crescent Replaces This Kit

The Crescent wrench is adjustable to any size, while sacrificing none of the advantages of the solid wrench.

The thin, flat head, set at the scientific angle, makes usually difficult places accessible. Correct design permits adjustment with the hand holding the wrench.

Crescent material insures durability.

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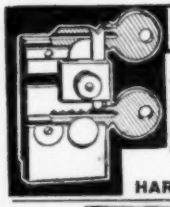
PULLING TEETH OF WHALES AT SEA—In the museum of the Dartmouth Historical Society, at New Bedford, Mass., there is a collection of ivory carvings made mostly from whale teeth on board old whaling ships on long voyages, says the Marine Journal. Capt. George L. Howland, who served 19 years in the old whale ship "Canton," told recently of pulling teeth at sea.

"First," he said, "the jawbone was cut from the whale and lifted on deck by a tackle. It was then lashed firmly to a ringbolt in the deck. The gum was cut from the teeth on both sides of the jaw with a whale spade. A seaman then took a crowbar and drove it in hard under the first tooth at the end of the jaw. A line was



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Mfrs. of Mechanics' High Grade Tool Cases.
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LE PAGE'S CHINA CEMENT
STANDS HOT AND COLD WATER 10¢

The slightest cut, received while working with tools, may become infected.

LISTERINE
The Safe Antiseptic

should always be at hand, so it may be applied promptly to cuts and small wounds to prevent infection.

strapped around the first two or three teeth thus loosened and three men then hauled on the other end of the tackle, loosening the whole row. The big ivories were then cleaned and usually distributed among the men who wanted to make carvings. In a fully developed whale there are 46 teeth, varying in size from three to seven inches."

Many ornamental things were made by the whalemen from these teeth, but the majority of the carvings in the collection are very fancy pie cutters.

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The ONLY interlocking, sliding rule made

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MASTER SLIDE RULE

Here is the Exact INSIDE Measurement
Best, quickest, most accurate rule for outside measurements, too.

If not at dealer's, send his name and 20c per foot (any length, 2 to 8 ft.), and we'll send rule prepaid.

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repairs cracks, breaks or defects in aluminum in ½ the time and cost of acetylene welding. Parts so mended are **stronger** at welded joint than elsewhere. Gasoline torch only thing necessary. No flux needed.
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PRINTERS and ELECTROTYPERS
use it for squaring up and sizing electrotypes

The plane moves in a run-way, insuring absolutely the same position of cutter for every stroke.

Can be adjusted to plane at any angle between zero and ninety degrees.

Cutter can be set to give any draft desired to a pattern. Special circular containing full description upon request. Base 22 in. long—plane 15 in. long—cutter 2⅜ in. wide—weight 17½ lbs.

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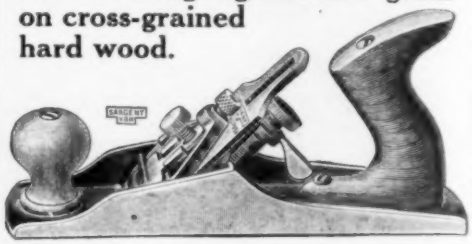
Automatic-Set Bench Planes

For working against the grain on cross-grained hard wood.



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The automatic set is a great time saver; the rigidity insures good work; and the ease of adjustment is a great advantage.

These features are fully explained and the six sizes of these Planes described in the Sargent Plane Catalogue, a copy of which will be sent free on request.

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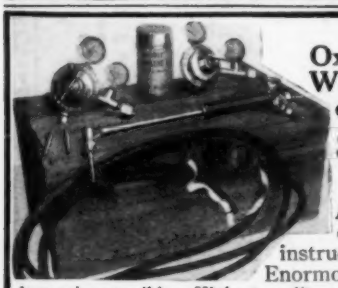

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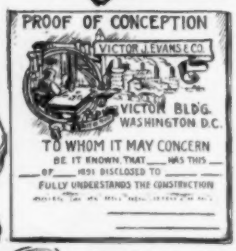

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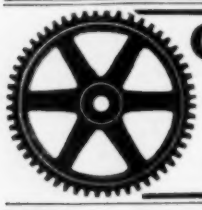

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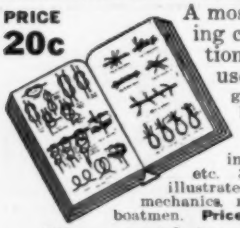

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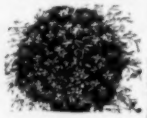

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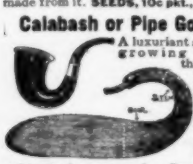

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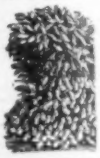

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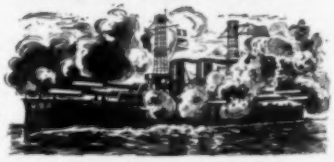

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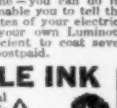

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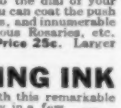

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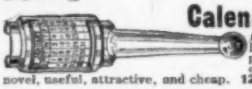

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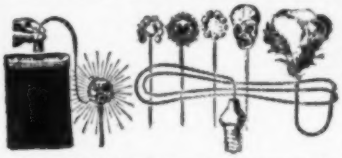

When wearing one of these you become "the observed of all observers," the "cynosure of wondering eyes," the admiration of ladies and the envy of the men. As shown in the illustration, the pin is connected by a double insulated wire with the flashlight, that you carry in your pocket. By merely pressing the button the Scarf Pin bursts into dazzling effulgence that attracts instant attention. The effect is both startling and beautiful. **The darker the night the more brilliant the illumination appears.** The Pins and Flowers may be worn without being illuminated, and they are very attractive. Assorted designs, including Skull, Horse Shoe, Pearl, Colored Stone Cluster, Flower, Auto Lamp, etc. **Price,** not including flashlight, **75 cents each.** Flashlights, for using with above, **75 cents.**

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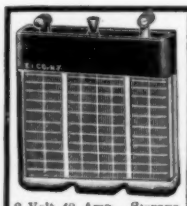

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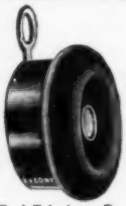

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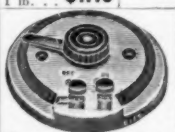

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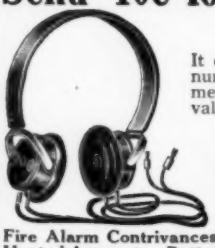

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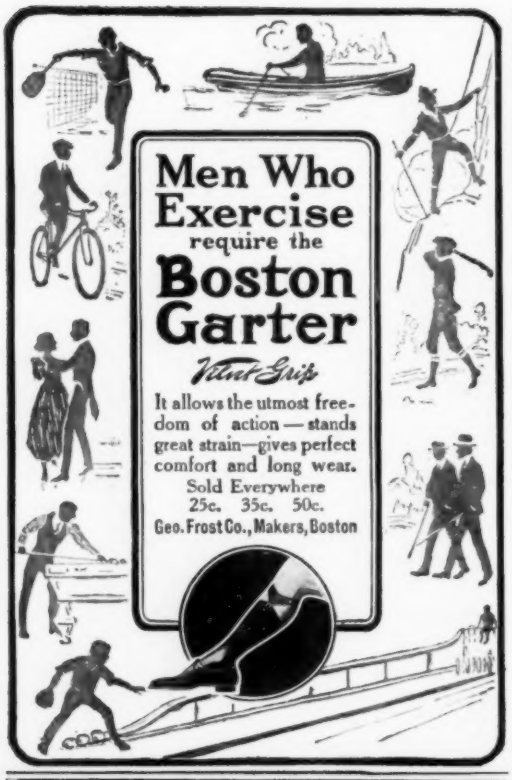

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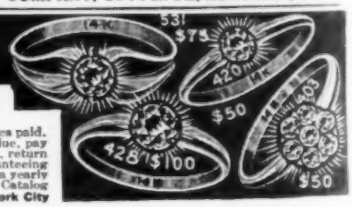

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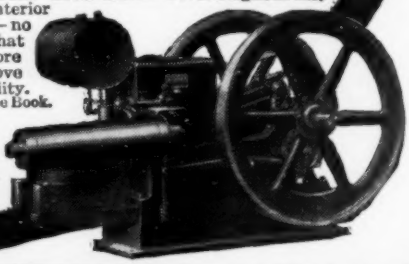

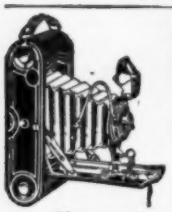

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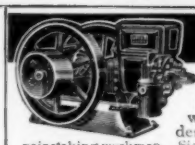

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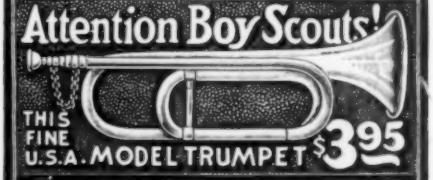

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A large middle Western manufacturer states "we are interested in any novelty that has merit and can be manufactured at an attractive profit. We would prefer something selling to the shoe trade; however, will consider any good novelty. We would rather favor the royalty proposition."

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National Locktile Co., Washington, D. C.
The Carnahan Press, Washington, D.C.
Lightning Gun & Cycle Works, Oklahoma City, Okla.
Antholene Mfg. Co., Hutchinson, Kan.
National Rack Co., 61 Hanover St., Boston, Mass.
The C. J. Loftus Co., 13 Spring Common, Youngstown, Ohio.
Whitehead Hosiery Mills, Burlington, N. C.
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Munsey Trust Co., Washington, D. C.
The Auto-Ordnance Corp., New York City
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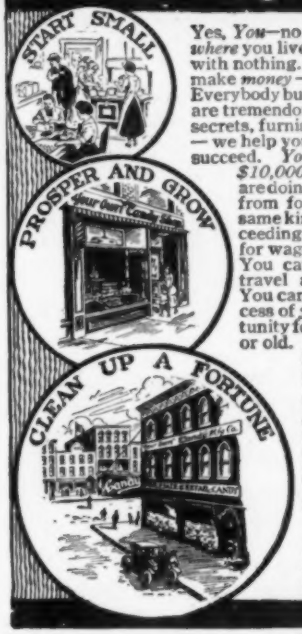

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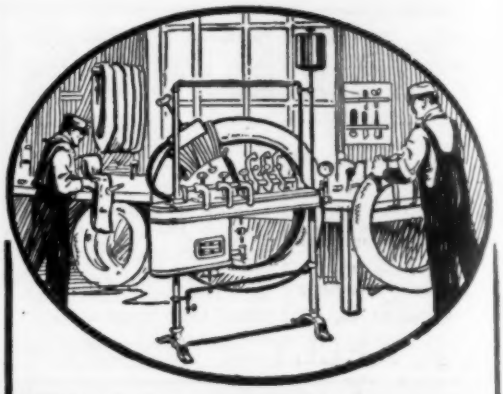

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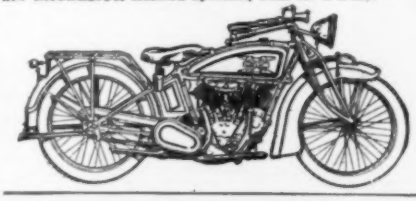

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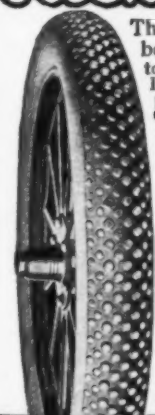

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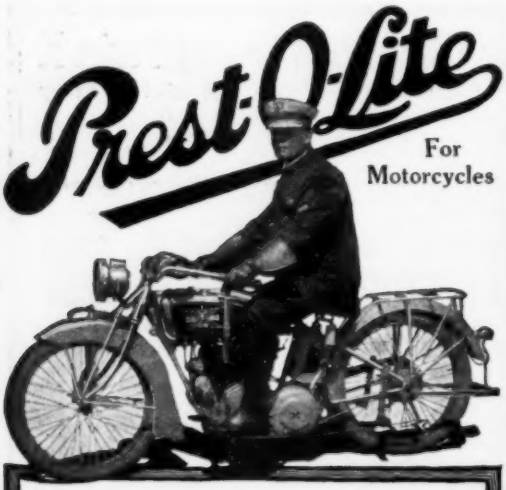

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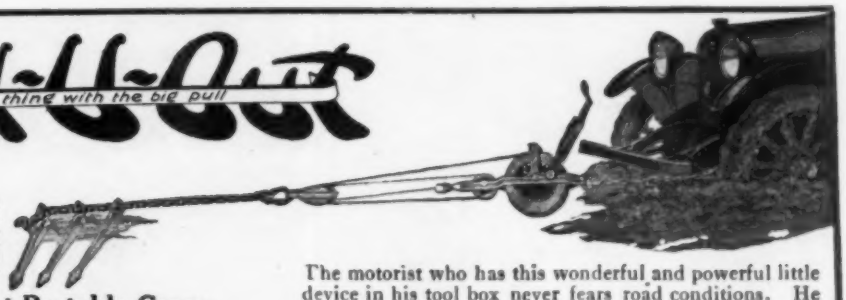

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We also make a wonderful portable crane. Weighs only 300 lbs.; lifts 1000 lbs.; 9 ft. 6 in. Easily moved wherever needed. Slip-jointed; can be put together in a few minutes with an S wrench. Has longer reach; weighs about ½ as much as other cranes of same capacity costing twice as much. Pull-U-Out easily detached and used for other pulling and hoisting.

Guaranteed and shipped on a strictly make good basis!

The motorist who has this wonderful and powerful little device in his tool box never fears road conditions. He knows that the moment his car gets stuck in the mud, skids into a ditch or overturns, he has efficient and immediate help at hand. No motorist can foresee these accidents. They come unexpectedly and without warning and are likely to happen to even the most experienced motorists. You may be miles from the nearest house when an accident happens, or you may skid from a perfectly good road into a ditch.

It is at such time that you will bless the day you bought powerful little Pull-U-Out. If your car gets stuck in hub-deep mud, Pull-U-Out will have you out and on your way rejoicing inside 10 minutes, without delay, trouble, damage to car or clothes, or expense. Unaided, a boy with a Pull-U-Out can pull a 5,000 lb. auto out of hub-deep mud easily. Pull-U-Out combines a rescuing device and a tow line—two things *every* auto *should* have. *WRITE FOR FREE ILLUSTRATED BOOK.*

Does wonders in factory, garage, repair shop!

It's an efficiency device of the first order. Does the work of a number of chain blocks, because it can be easily moved about by one man and used wherever needed. Pulls as well as lifts; is lighter than a chain block, has longer reach, will work in any position, costs less than half and will do lifting and pulling jobs that now require several men. Lifts 2,000 lbs.; pulls 100,000 lbs. on wheels (larger sizes have greater capacities).

Pull-U-Out Sales Co., 2035 Market St., St. Louis, Mo.

Bicycle Book FREE

A book to delight boys and girls' hearts. Save money! Offers **guaranteed** bicycles — $19.95 and up. Write nearest house. **Dept. G 133**

Montgomery Ward & Co. New York, Chicago, Kansas City, Ft. Worth, Portland, Ore.

Auto Heel Rest for Fords

SIZE 8"x 7"x ⅛"

Made of frosted aluminum. A neat, useful foot rest, sold by all dealers at $1 each, or will be sent postpaid on receipt of price.

Dealers—Send for circular and trade discount. Made only by

J. L. LUCAS & SON, 10 Fox Street, Bridgeport, Conn.

FORD AUTO GIVEN TO AGENTS

HERE'S an opportunity to earn big money—$6 to $12 a day, with easy work, all your time or spare time and obtain a Ford Automobile besides. A straight out from the shoulder business proposition. No voting or guessing contest. We want wide-awake men and women to introduce into every home our famous ZANOL Pure Food Products, Non-Alcoholic Food Flavors in tubes, Toilet Preparations, Perfumes and Soaps; 250 other light weight household necessities.

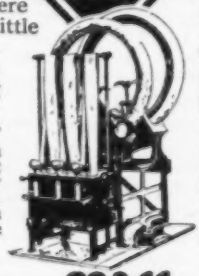
Make $50 a Week Easy

No experience necessary—we teach you how, give you the right start and help you make a success. Absolutely no limit to your earning power. We can use only a certain number of General Agents, so get in touch with us at once. We furnish our representatives with an automobile. Just send postal for particulars and money making offer.

AMERICAN PRODUCTS CO.
8239 Third St., Cincinnati, O.

Start a Tire Repair Business of your own

Get into the one line where there is more work than men to handle it—where you need but little capital or experience to make big money from the start. Over a hundred million dollars is being spent this year for tire repairs. It's easy for you to get your share with—



60 of the largest tire manufacturers use this equipment to repair tires in their own factories and branches—sell it to their dealers because they know it is built right and does the best class of work. Car owners don't want to take chances with their tire repairs. That is why you can make the biggest profit from—

Akron-Williams

TIRE REPAIR EQUIPMENT

Send Back This Coupon Get this *free book*

It is brim full of just the information you need. Gives you all the details. Tells you how to make money with an Akron-Williams Outfit right from the start. Shows **your opportunity** in this big field. Write today—**Now.** Your free copy is ready.

The Williams Foundry & Machine Co.
58 Cherry St., Akron, O.
Gentlemen:—Please send me your free book. This of course with no obligation on my part.

Name.....

Address.....

.....

They Were Prepared for This

BEFORE they started to coast this hill they knew from past experience that they were taking no chances—they knew that they could rely absolutely upon the powerful grip of the famous

CORBIN

DUPLEX COASTER BRAKE

There can be no improvement on this brake. It is powerful, it is durable, it is simple, it is reliable.

With a Corbin Duplex on your hub you are in a position to handle quickly and conveniently any situation that might arise on road or street. Elbow turns, dizzy hills and traffic-laden thoroughfares present not the slightest difficulty. It gives you complete mastery over your bicycle, a freedom and control that doubles the pleasures and possibilities of riding. It has no equal.

"Corbin Control Means Safety Assured"

Specify it. Sold and equipped by all dealers. Catalog on request.

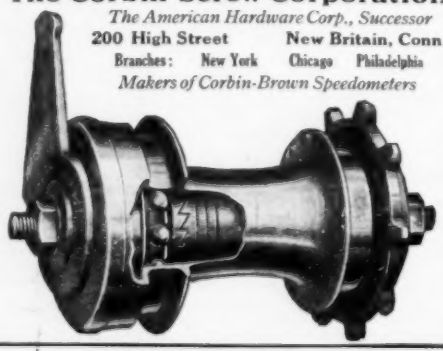
The Corbin Screw Corporation

The American Hardware Corp., Successor

200 High Street New Britain, Conn.

Branches: New York Chicago Philadelphia

Makers of Corbin-Brown Speedometers



Please Mention Popular Mechanics

Here comes a real Coaster Wagon —with real speed and real "pep"

Auto-Wheel Coaster

Other wagons have to get out of the way when it's gliding down the hill. Its record for making time gives it the right-of-way.

The roller-bearings, protected by dust-proof hub-caps, insure speed AT ALL TIMES.

Free Pennant and descriptive literature for names of three local coaster-wagon dealers. Mention those who handle the Auto-Wheel

Built for Service—Not a Toy

The Auto-Wheel is solidly constructed. Stands wear and tear of long use, but always rides fast and smooth —like an automobile.

In Canada: Preston, Ont.

BUFFALO SLED CO. 137 Schenck St., N. Tonawanda, N.Y.

THE "SURE" SIGNAL

Sure in operation—sure to receive a "hearing" and instant obedience. New, superior style whistle warning. Not an exhaust signal. Different. Better. Screws in place of priming cup. Blown by direct explosion. Penetrating. Positive. No operative—repair—or upkeep cost. Standard equipment on numerous cars. Send for free literature. Get acquainted with the one safe—sure satisfactory signal.

THE BUELL CO.

1610 Michigan Avenue CHICAGO

More Miles From Gasoline—Guaranteed!

The Wilmo Manifold gives your car a flying start at the first few turns of the motor—increases gasoline mileage from 42 to 54 per cent by actual official A. A. A. tests—keeps the engine free from carbon—makes a smoother running motor at all speeds. Quickly and easily applied with a monkey-wrench. No holes to bore. Absolutely guaranteed. Made for various cars. Price $7.50 up. Ask your dealer or garage man, or write.

THE WHITTIER CO., First National Bank Building, CHICAGO

Start a Big-Paying Business of your own with a BADGER TIRE REPAIR OUTFIT

The man who's equipped to supply the stupendous demand for auto tire repairs can make an assured income of **$100 to $300 or more per month.** The famous **Badger Solid Pad System** with its strong array of improved features

insures your customers quick, economical, high-grade repair jobs, the kind that build up steady trade. We teach you free and help you start the business. Write for copy of Catalog and details of complete money-making Free Aid Service.

TIRE REPAIR EQUIPMENT CO. 601 Johnson Street APPLETON, WIS.

Delivered TO YOU FREE

No other concern will offer you such values or such terms. Make your choice from

44 Styles

colors and sizes in the famous **"Ranger"** line of bicycles, *freight prepaid* to your town. Sent on approval for **30 DAYS' FREE TRIAL.** From our new big catalog select the particular style of **RANGER** bicycle you desire. We pay return charges if you decide not to keep it. You get one month riding test at our expense. **LOW FACTORY PRICES** direct from one of the largest, oldest and most successful bicycle concerns in the country.

Electric Lighted RANGER Motorbike

We Want a Rider Agent in Every Neighborhood

TIRES

Lamps, Horns and **parts** for all bicycles at *half usual prices.*

Send No Money but write today for this big free catalog, also full particulars of new *30-day free trial offer.* Do not buy until you receive it. *Write Now.*

MEAD CYCLE COMPANY
Dept. C-108, Chicago

STANWELD Cold Drawn Seamless Steel TUBING

Lightest, smoothest, strongest Steel Tubing made. World's largest manufacturers of bicycles, motorcycles and automobiles use it exclusively. Send for Folder "A."

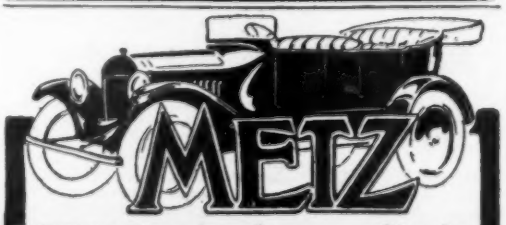
THE STANDARD WELDING COMPANY
Main Office and Factory **CLEVELAND, OHIO**

FORD OWNERS

The Van Sicklen Headlight DIMMER & INTENSIFIER

Makes night driving safe. A mere flip of the control switch instantly provides the kind of light you need at any speed. Easily installed. Unfailing in results. Write for free booklet, "*Headlight Control.*" Address **The Van Sicklen Company, Elgin, Illinois**

Price $4 Complete



DEALERS WANTED to make money selling the famous METZ Car—**$650 completely equipped.**

108" wheel-base — 4-cylinder 25-h.p. motor — 7 forward speeds — electric starting and lighting, etc.

Write To-day for full details of the Money-Making *METZ Proposition*

METZ COMPANY, WALTHAM, MASS.

PUT A CRIMP IN FUEL COSTS

YOU have no part in the establishment of gasoline prices. You *must* bow to the current per gallon "cost sign"—a high one, too. But you can, however, through employment of the

New Stromberg Carburetor

reduce the cost of car operation by reducing the *amount* of fuel consumed—by getting *more miles* per gallon.

The unapproached records of gasoline economy created by the New Stromberg Carburetor would appear miraculous indeed could they not be explained by proper principles of operation, and would bear the stamp of achievement attained under most favorable conditions were they not solidly backed by day after day performances of **pronounced** reduction in fuel consumption on all styles of cars.

Installation of the New Stromberg Carburetor on **any** car not only means instant and decided reduction in fuel consumption, but also increased speed, easier starting and more perfect acceleration.

Write for full particulars, giving name, model and year of your car.

STROMBERG MOTOR DEVICES CO.
Dept. 614
64 East 25th St., Chicago, Ill.

New STROMBERG Does it! CARBURETOR

"There She Goes!"

Why Didn't I Use

NEVERLEAK TIRE FLUID

Boys! why take chances? Why waste time fixing punctures? Why pump, pump, pump, trying to keep up a porous tire. Get *all* the fun out of your bicycle, and save money on your tires.

A 25c Tube of Neverleak Tire Fluid

— heals punctures instantly — keeps porous tires up to pressure — increases the mileage of your tires — doubles the life of new tires.

Your bicycle dealer knows the value of Neverleak. For 25 years it has been the "Old Reliable" with tire manufacturers, repairmen, and hundreds of thousands of riders.

Get a tube or two today from your nearest bicycle store, and find out what it means to get rid of all tire troubles.

BUFFALO SPECIALTY COMPANY
BUFFALO, N. Y.

No More Creaky Wheels

Last summer thousands of motorists stopped the creaking of their heat-shrunken wheels with Spoktite. And they prevented the rattling and possible collapse that might have followed. Be on the safe side yourself this year—at least be without creaky, squeaky wheels.

Use SPOKTITE

It penetrates the pores and prevents shrinkage. $1 saves 4 wheels. Auto supply dealers—or postpaid on receipt of dealer's name and $1.

LIQUID WHEEL TIGHTENER CO.
Dept. F, Modesto, California
Sales Offices: Boston-New York

For Auto, Buggy Or Wagon Wheels

A New Butler Tank Was Born May 12

It's Name Is Rus-Pruf Jr.

At last you can buy a steel tank made along scientific lines, and backed by long actual experience. We know this new tank is right. It's the greatest value on the market.

War time shortage of steel made it necessary to bring out something new in steel tanks or raise the price away up. Rus-Pruf Jr. is the result. It's your patriotic duty as well as an economical necessity to read our booklet before buying a steel tank.

GET THIS FREE MONEY SAVING BOOK NOW.

Get this free book today. It's interesting and instructive. Write our nearest factory.

BUTLER MFG. CO.
804 Butler Bldg., Kansas City, Mo.
899 6th Ave. S.E. Minneapolis, Minn.

Truck Bodies, Gasoline Systems, Garages, etc.

CHARGING AUTO BATTERIES PAYS BIG

Every HB Charger can net the garage owner $20.00 to $60.00 per month. No experience required to operate. Current costs 15c per battery. You get 75c to $1.50 from the motorist. Charges up to seven batteries at once. This money-maker shipped ready to install for $15 with order, balance in easy monthly payments. Absolutely guaranteed. Can be returned if unsatisfactory. Write for full particulars, enclosing this ad. Hobart Bros. Co., Box 56, Troy, Ohio

Vitalic Bicycle Tires Deluxe

$8 a pair, Brigadier $6 a pair — made for endurance

Continental Rubber Works, 1964 Liberty St., Erie, Pa.

The Cleveland Lightweight

The only light, low priced Motorcycle with straight line worm drive. Weighs 150 pounds. Highest quality throughout. 75 miles to the gallon. 600 sold in one city last year. Price, **$160.00**; with Kick Starter, **$170.00**. Dealers wanted.

THE CLEVELAND MOTORCYCLE MFG. CO.
7202 Platt Avenue, CLEVELAND, O.

Russel

Internal Gear Drive Axle

The most serviceable and economical motor truck axle made. Write for convincing reasons why your truck should be equipped with the Russel Axle.

RUSSEL MOTOR AXLE COMPANY, Central Ave., North Detroit

Attractive Catalog Free

Columbia BICYCLES

Westfield Manufacturing Company.
Department 15. Westfield. Mass.

INSTALL Your Own PLUMBING

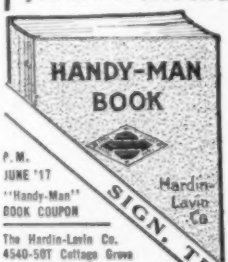
Our new *Hardin Easy Way* enables anyone to easily install a complete plumbing or heating system. Our method is perfect, simple, and easy. Reduce the high cost. Install your own plumbing and save time, labor and material. Our 40 years selling plumbing and heating goods *exclusively* direct has qualified us to turn out all material equipped with patented easy adjustable connections that any handy man can do the work himself and SAVE ½.

Our Service Helps You Plan and Install

Send a sketch or plan of any plumbing or heating job. This department will show you the easiest and cheapest way. They will draw simple, clear and easily understood installing plans free. If necessary, we will loan you the tools. Our *Cut-to-Fit* steam, hot water and air heating plants save the high cost of labor, unused material, costly delays, time and price. Buy *direct* from the producer.

Send for Valuable "Handy-Man" Book

This book tells you in advance what your plumbing and heating will cost. Gives you suggestions on what fixtures to select and how to install them. Every contractor, home owner, institution, etc., needs this valuable book. It explains the new *Hardin Easy Way*. Tells you how to save on material, time and labor by putting in plumbing this new, original, exclusive, practical, and economical way. It contains a complete line of latest improvements and new designs in guaranteed plumbing and heating outfits, water supply systems, sinks, roughing-in goods, pipe, fittings, valves, etc., and all parts and repairs at *wholesale prices*. It also contains practical and exclusive information of value to every builder. ***Note:*—To avoid sending this 236-page *Handy-Man Book* broadcast to non-interested parties, we request 25c as a temporary deposit, which will be refunded on first order.**



P. M.
JUNE '17
"Handy-Man" BOOK COUPON

The Hardin-Lavin Co.
4540-50T Cottage Grove Ave., Chicago

Enclosed please find 25c (to be refunded on my first order) for which send me your **"Handy-Man"** Book showing everything in plumbing and heating supplies at lowest wholesale prices.

Name .....

Address .....

.....

SIGN, TEAR OFF AND MAIL

Money-Back Guarantee

Our *"Money-Back Guarantee Label"* is on every fixture. It protects you, and assures you that all *Hardin-Lavin* fixtures are Highest Quality, Grade A, Guaranteed. Our aim is to furnish plumbing and heating plants with new, original, easy installing features, combining highest quality, lasting durability, and complete satisfaction.

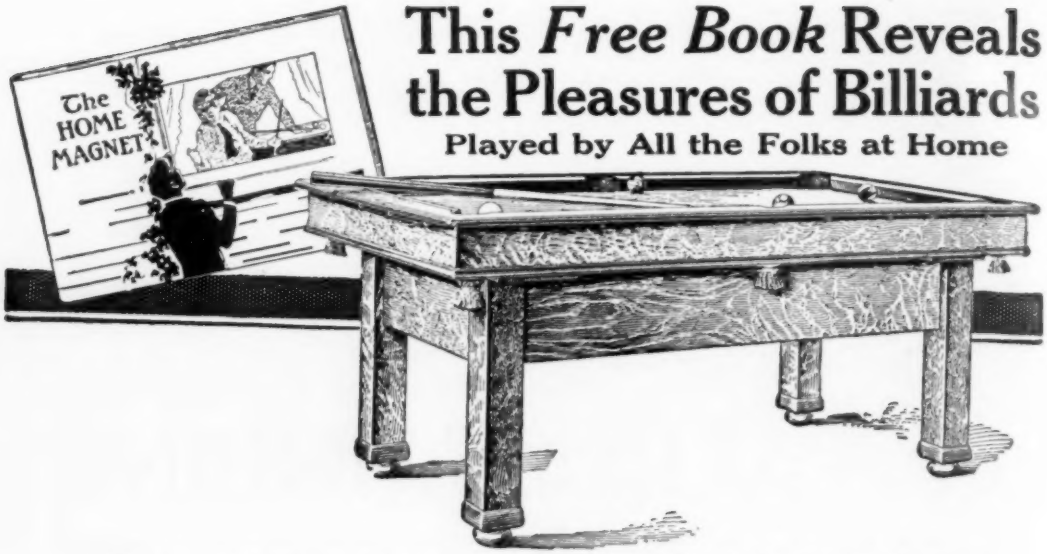
Immediate Delivery

This is as much a part of our special service as our guaranteed quality or wholesale prices. 40 Years in Business at the same address is a record to be proud of. It speaks volumes for our wholesale price policy and money-back guarantee. Send for "Handy-Man" Book and full particulars. $500,000 plants behind our guarantee.

The Hardin-Lavin Co.
40 Years at
4540-50T Cottage Grove Ave.
CHICAGO

This *Free Book* Reveals the Pleasures of Billiards

Played by All the Folks at Home



This book is crammed full of things about billiards that will interest you. Shows these tables in photographs of homes just like yours. Also letters telling about the rollicking good times others have had from their Brunswick.

What Doctors say about Billiards. Shows how to play 33 different games, all on a Brunswick. Explains about Brunswick low prices and our offer of "pay while you play." It's a regular storehouse of interesting information.

BRUNSWICK
HOME BILLIARD TABLES
Pay While You Play—10c a Day

A Model for You

Our "Quick Demountable" Brunswick is an ideal table for you. Folded up it can be put in a closet or any spare space, out of the way. In a jiffy it can be set up in the center of the room, chairs shoved aside and the big game is on.

Other models are the "Grand," "Baby Grand," "Convertible." There is a size and a style to fit in any home.

Balls, Cues, Etc., Free

With every table you get a complete high grade playing outfit —Balls, Cues, Racks, Markers, Tips, Cue Clamps, Chalk, Brush, Expert Book of 33 games, etc. No heavy after costs. Once you have paid for the table, all expense is ended. *Don't fail to send for our free catalog today.*

SEND TODAY FOR YOUR COPY

The Brunswick-Balke-Collender Company

Dept. 50T, 623-633 S. Wabash Ave., CHICAGO

THE BRUNSWICK-BALKE-COLLENDER CO.
Dept. 50T, 623-633 S. Wabash Ave., Chicago

Send free, postpaid, a copy of your billiard book and color catalog—"**Billiards—The Home Magnet**" —and tell about your home trial offer.

Name.....

Address.....

BLUE STREAKS

Your clothier or haberdasher—does he apologize for his deliveries? Or does his service win your admiration? Many such merchants today have advanced to the use of the motorcycle. And the shrewdest of these employ Goodyear Blue Streak Motorcycle Tires so that deliveries may be unfailing and prompt. Blue Streak reliability is a well known factor in business, pleasure, racing and military service. Somewhere in these fields, Goodyear will serve you, too.

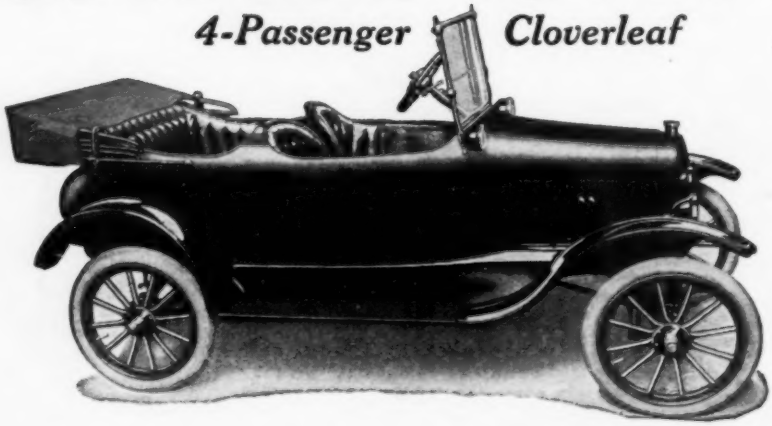
Blue Streaks Deliver: Economy, Mileage, Speed, Service. Everywhere—one standard, one quality, one guaranty.

The Goodyear Tire & Rubber Co.
Akron, Ohio

GOODYEAR
AKRON

Ames-bilt

4-Passenger Cloverleaf



You'd Never Believe It Was Your Ford

Any Ford—new or old—can now be put in the luxury car class. It can be given the grace, beauty, comfort and luxury of the high priced cars and still retain the economy, the dependability, the sturdiness and the low upkeep cost of the Ford. Look at the picture above (the side view) and then the one below (the aeroplane view). Such a class car is possible with any Ford chassis and an Ames-bilt Body. Beauty, strength, class, power, economy and luxury combined.

Everything Is Included

The transformation is easy, quickly and economically made. Anyone can do it. No skill required. Everything is furnished. Note the specifications below for the Four-passenger Cloverleaf as pictured. Every provision for comfort and luxury is made. All the class, style and snap required to put your Ford in the "envied" class.

In a few moments you can change your Ford from a car that looks its $375 to a car with the appearance, luxury and comforts of one costing many times as much. But you still have the economy and low upkeep cost of a Ford.

Send your order to us today for one of these wonderful bodies. Immediate shipment, satisfaction guaranteed. Price $215 F.O.B. Factory.

Note These Brief Specifications

FRAME: Selected hardwood. All joints mortised, glued and screwed, solidly reinforced and ironed by hand.

DOORS: Concealed hinges. Entrance from both sides, front only. Best quality 20-gauge automobile sheet steel throughout.

UPHOLSTERING: Best quality genuine M. S. leather, stuffed with real curled hair. Deep, luxurious cushions.

BODY comes complete with one man top, clear vision windshield, hood, radiator shell, running boards, fenders and skirts, ready to attach.

The F. A. Ames Company

1306 Third Street OWENSBORO, KY.

EVEREADY DAYLO

The light that says
"*There it is!*"

There are nooks and corners in every home that even daylight cannot reach—

where matches, candles or lamps are positively dangerous. That's why you need an *Eveready* DAYLO* about the house, *for both convenience and safety.*

Nearly all good electrical, hardware, drug, sporting goods and stationery dealers display and carry *Eveready* DAYLO'S* in 77 different styles at prices from 75 cents up. And your satisfaction is always assured by the *Eveready* TUNGSTEN battery, the only battery that is long-lived, dependable and really economical. Always specify this make when your battery must be renewed.

*DAYLO is not merely the new name for our product, but a mark by which the public will hereafter distinguish between the ordinary "flasher" or "flashlight" and the highest development of the portable electric light.

AMERICAN EVER READY WORKS
of National Carbon Co. Long Island City, N. Y.
Canadian National Carbon Co., Limited, Toronto

when a leak in the water or gas pipe must be fixed quickly.

when you lose a key, a coin or a ring in the dark.

when the watch dog barks his alarm.

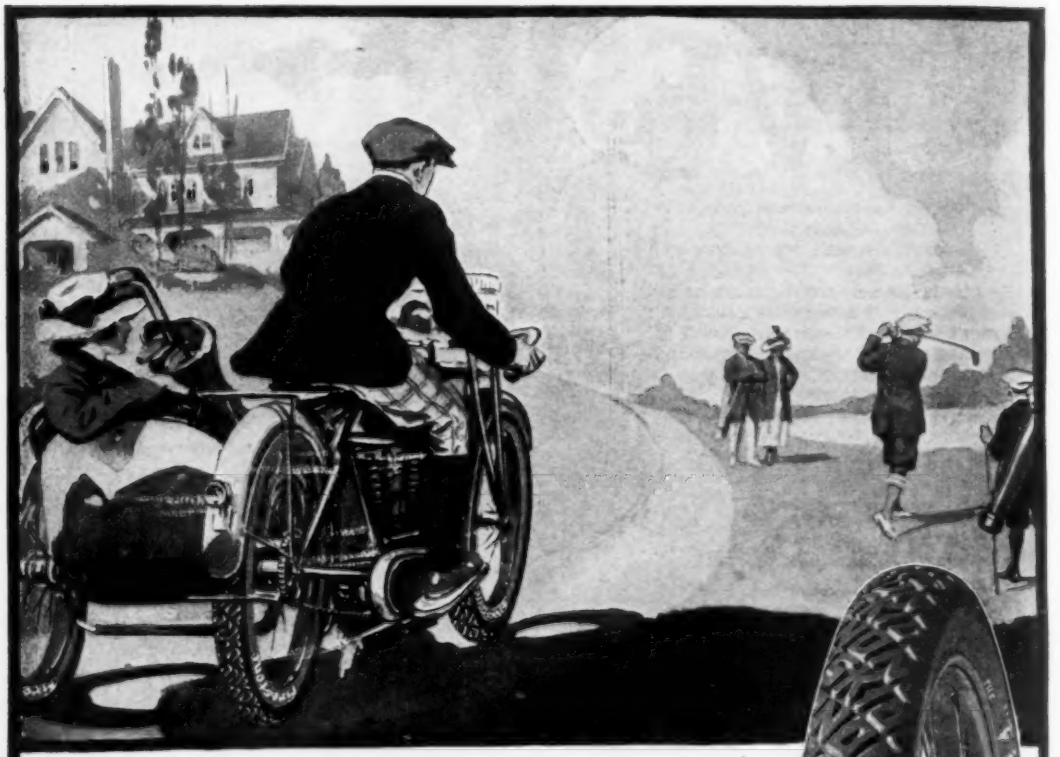
when all the lights in the house go out

when the wrong medicine bottle may mean a tragedy.

when you awake in the night and wonder what time it is.

whenever you need light—indoors or out—that cannot cause fire or blow out—you need an *Eveready* DAYLO*.

Don't ask for a flashlight—get an Eveready DAYLO

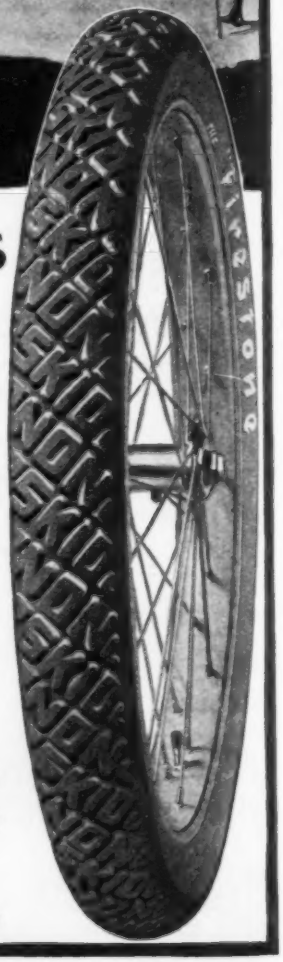


A Quick Trip To The Links

TO arrive "on time," ride on Firestone Tires. These extra thick-tread, extra tough-fibred, wear-like-wire tires give most comfort in riding and "Most Miles per Dollar" in tire endurance. And 30 per cent greater angle against skid renders them the safest equipment for your mount on any road at any speed.

Furthermore, you can enjoy the extra value of Firestone Motorcycle Tire equipment at no extra cost, if you buy a Cleveland, Dayton, Emblem, Excelsior, Harley-Davidson, Henderson, Indian, Reading Standard, Schickel, Thor, Smith Motor Wheel.

FIRESTONE TIRE AND RUBBER COMPANY
Akron, Ohio Branches and Dealers Everywhere



Firestone

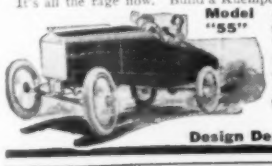
Motorcycle Tires

Have a Speedster Body

THERE is wonderful sport driving a speedster. Make a **Kuempel Speedster Body** for your Ford Chassis, with the wonderfully simple, **Red-I-Kut Patterns,** designed by our engineers,—you can build the body yourself in a very few hours for only a few dollars with a few simple tools. Your car will look like **$1500,**—with beautiful distinctive lines. Bodies are built low, making riding many times easier, increasing engine power and pick up, making cars keep the road better especially at turns, saving tires, gas and oil, giving greater riding comfort. [**Red-I-Kut Patterns** are life size, mistake proof,—just follow the simple instructions,—your car is ready in two days.

$4

It's all the rage now. Build a Kuempel Speedster and look like a "real owner." Let us send you illustrations of our various models. **Model "55"** shown here is the favorite,—patterns sent at once on receipt of only **$4.00.** Specify if for old or new Ford radiator. Get ready for the coming season now.



THE KUEMPEL CO.
Design Dept. 21 DUBUQUE, IA.

Diamond Banking

Why Pay Full Prices for Diamonds

WE lend money, taking diamonds as security. When loans are not paid, diamonds are sold. *For over 60 years* we have offered diamonds 40 to 50 per cent lower than market prices. *Free examination.* 8/4—3/16, 1/64 kt. blue-white genuine perfect cut diamond of high degree of perfection, wonderful fire and brilliancy.

Platinum and gold engagement ring. Try to match at $25. Guaranteed Cash Loan $100. Unpaid Loan Price . . $116.80

Write Now for New Bulletin
Send name and address to us—TODAY!
Jos. DeRoy & Sons, 1927 DeRoy Bldg., Pittsburgh, Pa.
Reference: Marine National Bank

1900 Motor Washer Electric or Water Power

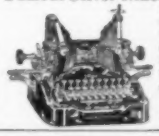
on Free Trial to Readers of Popular Mechanics

Reduce household expenses by using this great laundry outfit. Cuts cost of washing to **2 cents per week.** Write for Free Book, giving full details, to

1900 WASHER CO., 6336 Court St., Binghamton, N. Y.
Address Canadian 1900 Washer Co., 355 Yonge St., Toronto if you live in Canada

New Typewriters at Half Price

Famous Oliver Nines—brand new—latest model—standard visible — now $49 — formerly $100. Our amazing book, "The High Cost of Typewriters — The Reason and the Remedy," exposes old methods. Oliver has rebelled. So now you save $51. Low terms — free trial — no C. O. D. Write for book.



THE OLIVER TYPEWRITER COMPANY
1096 Oliver Typewriter Bldg., CHICAGO

Increase Your Tire Mileage

Crank Shaft Driven

Taylor Tire Pump

Carried in tool box when not in use, attached in 30 seconds to end of crank shaft (front of radiator). Pumps bone-dry air and pumps fast. Pays for itself in added tire mileage. If your dealer cannot supply you write direct.

$10 Complete with hose and gauge.

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WE PAY CASH for Scrap PLATINUM

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On rubber or metal plates. Highest cash price paid for old Gold, Silver, contact points, crowns, bridge work, mercury and broken jewelry. Send your package today by parcel post to

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ATTENTION!

Every soldier, every individual in a Home Defense League, every member of a semi-military organization, and in fact every citizen of the United States will need one or more of the following books at once:

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Infantry Drill Regulations

With War Department Text Corrections to February 12, 1917

Gives the officially prescribed army drill regulations for soldier, squad, company, battalion, regiment, and brigade as well as the rules for combat, marches and camps, ceremonies and inspections; includes the following Manuals: Color, Band, Saber, Tent-Pitching, Bugle (with bugle calls and signals), Arms and The Bayonet.

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UNITED STATES ARMY
Pocket Size *Latest Edition* *Cloth*
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Boys! Form your own drill squads. By following the official drill manuals you can make your training count.

These Books for Sale by
Popular Mechanics Book Dept.
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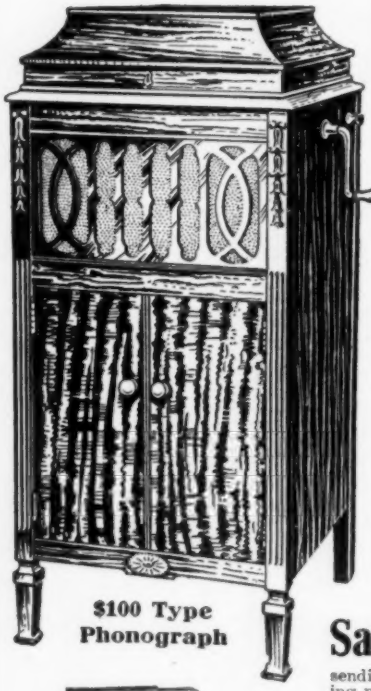
$100.00 Phonograph



$100 Type Phonograph

In Fine Tonal Quality and Rich Music Value with Your Own Cabinet

$7.85

New, amazing, money-saving offer on a fine phonograph. Now is your opportunity. Basic Patents have expired. You can now get the finest phonograph for the bare cost of the parts. You will be surprised how simple and easy it is when you have the parts. You will then have the finest machine with all the many big profits in your own pocket. The saving is positively astonishing. You can get all the metal and moving parts for only $7.85.

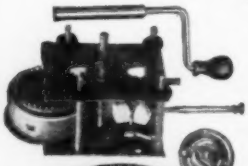
Build a Talking Machine

We tell you all the secrets of phonograph design and construction. All the secrets of fine tone and sweet music. We show you how simple and easy it is to assemble the finest phonograph. We furnish complete detailed blue prints of the fine cabinet shown in this ad, furnished to you for only 50c. Blue prints and all details of this fine cabinet sent free to you if you purchase the complete outfit of parts for $7.85. If you don't need the parts and want to assemble a magnificent cabinet, send us only 50c for the blue prints, plans and details for making the phonograph cabinet.

50c

Save the Big Profits

You can save the enormous profits on phonograph construction and assembling by sending to us for the parts. You get the parts all complete, all metal and moving parts, on this special offer for only $7.85. The reproducer of this quality alone would cost you from $7.00 to $15.00 from dealers. All metal exposed parts are nickel-plated. Send today and get all these parts for only $7.85.



Plays All Records

Your phonograph made by assembling these parts will play all Disc records. Plays Victor, Little Wonder, Columbia, Emerson, Edison and Pathe, and all Disc records up to 12 in. Motor full force with spring regulator.

Here Are All the Working Parts of $100.00 Type Phonograph

In addition to the parts illustrated we send you all necessary screws, needle cups, etc. When you get the parts you will be delighted to see how easy it is to assemble them and have your own magnificent phonograph. If you don't want to make your own cabinet use a table or any other suitable piece of furniture. You save the profits of *manufacturers, distributors, jobbers, dealers* and *agents*. Act quick and get the full benefit of this special offer.

Send Coupon

Send the coupon or copy it on a piece of paper. Enclose only $7.85 for all parts all complete, including the blue print, for making the fine cabinet, only $7.85. Blue print and plans for cabinet alone only 50c, free with parts. All parts guaranteed. Send today.

One of Many Unsolicited Testimonials

SINGER SEWING MACHINE CO.
SPRINGFIELD, MASS.

Electro-Mechanical Parts Co.,
Chicago

I am very pleased with the motor and tonearm and now have a grand good cabinet, which makes as fine a phonograph as any on the market at $300.00. The tone of vocal and all music and voice is as real and free from fault as in any high priced phonograph.

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Special Coupon

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GENTLEMEN: I wish to take advantage of your special limited offer on complete set of working and moving parts for $100 quality phonograph, and blue print of plans free. I enclose $7.85 for parts as advertised with your guarantee attached.

Name .....

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We Sell Everything to Make Phonographs

All styles and types of motors, electric and spring wound. Reproducers of all styles. Descriptive circulars and all particulars free. *Send today.*

Electro-Mechanical Parts Co.

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ON THE MARCH

Whether with the army afield, or in peaceful pursuits, the walker's muscles and veins must not be confined. You will like the

E. Z. GARTER

"THE ONE THAT WON'T BIND"

Made WIDE for Comfort and Free Circulation

No straps, buckles or adjustments.
Quickest on and off. Cool in summer.

25c for lisle, 50c for silk. If not at dealer's, send his name and price to

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Dealers: **Ask your jobber, or order sample dozens from us without obligation.**

TEMCO

Connects to ordinary electric lamp socket—wound for any voltage from 50 to 250 A.C. or D.C.

This Electric Tool pays big returns

to shops, factories and maintenance depts. all over the country

The grocer doesn't send a dray to deliver a can of baking powder. Nor should shops and factories set big stationary machine tools for hurry-up or odd jobs, but rather use the Temco Portable Electric Tool, ready in an instant to drill metal or wood, tap threads, drive or draw screws, and with attachments to sharpen tools, grind valves, etc.

Take this portable tool anywhere

and connect to lamp socket. Faster and more accurate than hand tools. Weighs but 9 to 19 pounds according to size. One and two speed types with instant reverse. Capacities to ¼ inch bore in steel. Staunch, durable. Temco motor costs but one cent an hour to run.

Write or see your jobber for literature and proof of the utility of this remarkable tool.

The Temco Electric Motor Company

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THE TOOL OF MANY USES

When You Build

please bear in mind that there is still plenty of

WHITE PINE

Send for our free booklet, "WHITE PINE IN HOME-BUILDING"

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GIVE YOUR CAR A NEW FINISH - DO IT YOURSELF WITH ONE OR TWO COATS OF

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MAKES your car look like new, at small expense. Not a wax or polish. A durable, quick drying, high luster auto finish. Made in seven colors, also Clear Varnish and Top and Seat Dressing. Keep a can of Effecto handy for touching up rusty spots. Sold by paint, hardware and auto accessory dealers. Send for Color Card. Pratt & Lambert-Inc., 153 Tonawanda St., Buffalo, N. Y. In Canada, 99 Courtwright St., Bridgeburg, Ontario.

MADE BY THE MAKERS OF

PRATT & LAMBERT VARNISHES

12 SIZE **FREE!**

Rich Advertising Offer to those who Answer Now!

A Special 12-Size Thin Model 25 Year Gold Case—fine 15 Jewel genuine Dueber-Hampden, now offered for the first time *direct to you* **Net Cost $2 -A- Mo.**

Finely finished—regulated to the second—fully guaranteed—just the watch you have always wanted. See it Now! A thousand being sent out on Approval this month. Our price is so low we cannot give it here, as retailers must be protected against our publicly giving wholesale prices, ***except to those interested enough to write now for our $5 Free Chain Offer.*** Your name and address on postal will do. This small ad means much to you if you answer at once! An amazing Watch Offer direct to you!

IMPORT MERCANTILE CO.

Dept. 122 KANSAS CITY, MO.

SMALL SET BACK

Veeder Counters

(Ratchet or Revolution)

RESET TO ZERO BY A SINGLE TURN

These counters are just as high grade as our large counters, but are lower in price. Price $5.

There are Veeder counters for practically every purpose. Our booklet describes these uses in detail and shows various instruments. It is **interesting and free.** Send for it.

The word Veeder stands for the best constructed and most accurate counting devices.

Cyclometers, Odometers, Tachometers. All kinds of counters. Fine Die Castings.

Half Size

VEEDER MFG. CO.
4 Sargeant St., Hartford, Conn.

HIGHEST AWARDS RECEIVED AT PANAMA PACIFIC INTERNATIONAL 1915 EXPOSITION SAN FRANCISCO

Sharpens Safety Blades Perfectly

At last, the perfect sharpener—the **Stag Sharpener.** The only sharpener that both **hones** and strops all makes of safety blades. Keeps blades in perfect shaving condition. Makes old blades better than new. Surprisingly simple. **Roller** in holder automatically sets blade always at correct **honing** and stropping angle. Our **New Patented Feature** makes inserting and removing blades easy. Just press rollers together. Heavily nickeled holder, barber's hone and strop in neat box, complete, postpaid, **$1.00.**

Try it 10 days; money back if not satisfactory.

Dealers Write for Special Introductory Offer

STAG CO. 38 So. State Street Dept. 5250, Chicago

Motorize Your Home with Universal Motors

Ask for Catalogue

Attach to any electric light socket and this Universal Motor will clean and polish your Silverware; sharpen your Carving Knives and Cutlery; drive your Sewing Machine, relieving you of foot pedal drudgery; grind your small tools, such as Scissors, Chisels, Screw Drivers, etc.; serve you as an Electric Fan with Fan Blade Attachment; operate efficiently as a Power Motor for Driving Cream and Egg Beaters, etc., and will perform many other household duties. **Costs only $6.00** complete with Buffer, Emery Wheel, Cord and Plug. Fan attach. extra.

Money back if not completely satisfied. Order today.

Racine Universal Motor Co., 53 W. Jackson Blvd., Chicago

Makers of Racine Fans, Vacuum Cleaners, Vibrators, Motor Appliances of All Kinds

YOUR SPINE NEEDS STRETCHING

This University discovery is the most important health invention of the century. It remakes and rejuvenates the Human Body. It produces normal spines. It frees impinged and irritated nerves, corrects contracted muscles, shortened ligaments; eliminates congestion, improves circulation and drainage of the body. IT WILL INCREASE THE BODY'S LENGTH. **THE PANDICULATOR CO., Cleveland, O.**

INDOOR CLOSET

More Comfortable, Healthful and Convenient than the Out-Door Closet

Eliminates the out-door closet and open vault. They are breeding places for germs. Have a warm, sanitary, odorless toilet right in your house. No going out in cold weather. A boon to invalids. Endorsed by State Boards of Health.

W. M. Davis writes: "Your indoor closet is giving absolute satisfaction. It is certainly the thing for a home without sewerage."

Absolutely Odorless
Put It Anywhere in the House

The germs are killed by a chemical process in water in the container, which you empty once a month. **Absolutely no odor.** No more trouble to empty than dishwater. Closet absolutely guaranteed. Write for full description and price.

Agents Wanted — Big Profits Wonderful opportunities in every town, village and in the country. Best season just at hand. Every home is a good prospect. Sell eight out of every ten you call on. Ernest Ridnell writes, "Have ten orders." G. A. Diesman says: "Ship at once twenty closets and fifteen washstands. Sold them all in one community." Sells itself. Everybody hates the outdoor closet. Everybody wants a **Ro-San Indoor Closet.** Write quick for territory and full particulars.

ROWE SANITARY MFG. CO., 605 Sixth St., Detroit, Mich.

Ask about the Ro-San Washstand — Hot and Cold Running Water Without Plumbing

ANY WATCH YOU WANT on CREDIT

1917 Models

WALTHAM
HAMILTON
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Sent on 30 Days Free Trial

No Money Down

Express Prepaid in Advance by Me

You take no chances with me. I am "Square Deal" Miller and I trust the people. That is why I am doing the greatest Credit Watch, Diamond and Jewelry business in the country. Suppose you want any one of the country's best makes of watches? Name any one, I have it for you. No money Down, Express Prepaid. **A full month to carry it in your pocket** and the easiest of Long Time Payments. That's the test that tells. All these watches **GUARANTEED 25 YEARS**

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My terms are made to suit you. You get unlimited credit, with no red tape, notes or collectors. All unnecessary detail left out.

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the same kind of credit you get from your grocer. No matter where you live or what your income is, you can now own the finest watch, a beautiful diamond or any rare jewelry and never miss the money.

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BE THRIFTY BUY A DIAMOND PAY MONTHLY

MONEY REFUNDED IF YOU CAN BUY CHEAPER FOR CASH.

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Fine Diamonds
Our diamonds are all perfect cut beautiful stones, white in color and lots of fire.

Fine Diamonds
You cannot buy by mail better diamonds at any price than we are selling on credit.

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Please send me your 1917 Catalog and explain fully your 30 Day Trial Plan and Easy Terms

Name.....

Address.....

Your Garage Doors "STAY PUT"

WITH THIS HANGER

The Perfect Garage Door Hanger Set

Use This Hanger on the Garage You're Going to Build This Spring

Allows use of full door opening without risk of damage to car or door, and door *cannot swing* or *blow shut*, as it automatically fastens itself open. No extended run-way on either side of building, and no sticking or getting out of order. Can be opened to any width desired, and is weather-tight when closed. No sawing or cutting of holes necessary to attach. Your doors "STAY PUT."

Ask your hardware dealer — Also send today for descriptive circular, surprisingly low price.

Dealers—Get ready for the big spring garage building season. There's big profit in this device, and there'll be a big demand. **Architects**—Specify this in your plans and make every client happy. Write for terms.

Safety Door Hanger Co., 106 Topping Bldg., Ashland, Ohio

$960

and accrued interest

will buy a $1000

Standard Gas & Electric Company

6% Gold Note

which will put $60.00 in your pocket annually—$5 for every month in the year.

Standard 6% Gold Notes combine the chief features of a desirable investment—safety of principal and interest—and better than ordinary yield. Notes may be purchased in denominations as low as $50.

Write today for earnings circular P.M.

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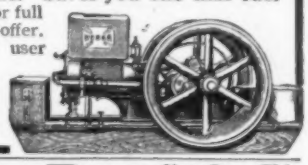
THROTTLE-GOVERNED VALVE-IN-HEAD

All 1917 Weber Engines are equipped with that great engine improvement, the "Weberator." Makes kerosene as convenient to use as gasoline. Kerosene has more units of energy per gallon than gasoline. Saves you one half fuel cost. Write today for full details and 60-day trial offer. Now sold direct to user at factory prices.



WEBER ENGINE CO.
Dept. 177 C
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10c a Day

Now Buys This Superb Farny Violin

An exquisite instrument. Made by the great Violin Maker, Henri Farny. Pay for it at the rate of 10 cents a day. One week free trial.

Rare Old Violin Circular Free — **WURLITZER** — *We supply the U. S. Govt.*

(50 years of instrument making)

Thousands of superb instruments to choose from. You get the benefit of our mammoth facilities by buying in large quantities.

Write Today for Special Circular. No obligations. See full particulars of our great special offer and handsome illustrations of the superb instruments that you have to choose from. Read our direct money saving offer. Write today.

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WORLD'S BEST SHOE VALUE

200 Other Shoe Bargains for Men, Women, Boys and Girls

Big New 1917 Scientific Footwear Catalog shows over 200 styles and how to save 20% to 50% on shoes for the whole family. FREE ON REQUEST.

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America's Greatest Mail Order Shoe Factory

GAS LAMPS

and LANTERNS for Kerosene or Gasoline

One to 600 candle power for homes, stores and all lighting purposes. The most satisfactory and reliable gas lamps made. Big profits to agents and dealers. **Write for catalog.**

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YOU SHOULD HAVE THE JAMES BERGMAN 160 PAGE JEWELRY BOOK IN YOUR HOME. 4,000 Photos, Diamonds, Watches, Jewelry, Toilet Articles, etc. Anything selected **sent on approval, all charges prepaid.** If satisfactory, Pay **20 per cent Down—10 per cent Monthly. Write Today** for big **Free Catalog No. 5.** It tells all about our confidential relations, Binding Guarantee and Liberal Exchange Offer. 10 per cent off for cash.

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YOUR OWN BOSS

Easiest thing—right in your town. Small investment—**sure** profit with a Kingery Peanut and Popcorn Machine. Prices $40 to $400—**easy to buy!**

Ask for particulars and Catalog No. 50.

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GTD

Greenfield Tap and Die Corporation

Gages-Taps-Dies

Threading Machines, Reamers, etc.

Greenfield, Massachusetts

CANADIAN FACTORY: Wells Brothers Company of Canada, Ltd., Galt, Ontario

GREEN AUTOMATIC MACHINE

Let This Machine Grind Out Money for You

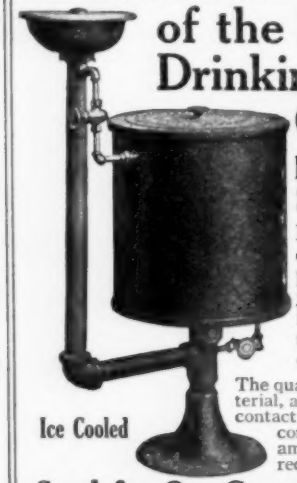
THE GREEN AUTOMATIC MACHINE $10 A DAY AND UP

Sharpens, Hones and Strops all kinds of safety razor blades in one operation, from four to six blades in one minute. For both quality and quantity this machine is in a class by itself. There is nothing like it on the market. Let us send you our free booklet explaining everything, including the **"AMERICAN" Key Cutter**—cuts square, angular or round slots.

AMERICAN SHARPENING MACHINE CO. (Inc.), 184 W. Washington St., Dept. 524S, CHICAGO

"AMERICAN" Key Cutter

A Scientific Solution of the Sanitary Drinking Water Question



Holds 75 lbs. of Ice. Supplies 150 Men.

Fifteen and one-half circulating coils of pipe in the cork-jacketed ice tank insure an ice-cooled sanitary drink to every employee.

Ice Cooled

The quality of the ice is immaterial, as it does not come into contact with the water. This construction reduces the amount of ice and water required to a minimum.

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showing our line of Wash Bowls, Metal Lockers, All Steel Stools and Chairs with Inset Wood Seats, Stock and Storage Racks, Metal Shelving, Metal Vault Fixtures, Improved Soda Kettles, 40 and 60 gallons, Water Heaters and Instantaneous Mixers, Bubbling Drinking Fountains, Work Benches and Bench Legs, Drawing Stands, full line of Plumbing Fixtures, etc.

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Write for FREE Book on Vibratory Massage

Explains this new scientific way of gaining health and strength with the Arnold Vibrator. Gives the low price with special 10 day trial offer.
Write today for this valuable book.

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Free to Wear 10 Days

Send no money. Just ask us to send you either of these wonderful, dazzling, genuine Tifnite gem rings to wear for ten days. See how beautiful it is. See how it stands all diamond tests. Write now while this offer lasts. Say which one you want.

No. 2—Ladies' guaranteed genuine Tifnite gem ring in beautiful six-prong solid gold mounting. Almost a carat Tifnite gem. Sparkles like a genuine diamond. An amazing Gem. Send no money.

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In ordering send strip of paper fitting around second joint of finger. Yes, send for either of these beautiful rings. If satisfied upon arrival send $3—then $3 monthly until the price, $12.25, is paid for ladies' ring or $12.75 for gent's ring. Otherwise return the ring within ten days and we will refund any payment made. This offer is limited. Send while it holds good. Send no money. Address

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No Money In Advance

This Marvelous CAMERA On FREE Trial!

Only 10,000 of these marvelous, instantaneous picture-taking and making cameras to be sent out absolutely on approval without a penny in advance just to prove that it is the most wonderful invention—the camera sensation of the age. So **you** must send for it **quick!** Just think of it—the new Mandel-ette

TAKES AND MAKES Finished Pictures Instantly!

You press the button, drop card in developer and in **one minute** take out a **perfect, finished** post card photo, 2¼x3¼ inches in size. Camera, itself, is about 4½x5x7 inches. Loads in daylight 16 to 50 post cards at one time.

No Films—No Plates—No Dark Room

Not a bit of the muss and bother of the ordinary kodak or camera. It is instantaneous photography. Universal focus lens produces sharp pictures at all distances. Pictures develop and print automatically. Can't overdevelop; results simply amazing.

We Trust You

No difference who you are, where you live or what your age, we will send you the complete "Mandel-ette" outfit absolutely on approval and give you 10 days to test it. If not satisfactory return it. But when you see what elegant pictures it takes—so quick, so easy, with no trouble at all—if you wish to keep it you simply send us $1.00 per month until our special price of only $5.00 is paid.

EASY PAYMENTS—NO REFERENCES

No red tape of any kind. Monthly payments so small you'll not notice them. Lots of fun and big profits.

NO EXPERIENCE REQUIRED

Plain instructions and everything complete with outfit so you can begin taking pictures the moment it arrives. We guarantee that even a child can operate it. Mail coupon right now. No risk or obligation to keep camera.

The Chicago Ferrotype Co.,
Desk 516 Ferrotype Bldg., Chicago, Ill.

Send me at once one complete model Mandel-ette Camera outfit including supply of post cards and instructions. I agree to examine and test it thoroughly and if satisfied keep it and pay you $1 a month until your special price of $5 is paid. Otherwise I will return it at the end of 10 days.

Name .....

St. and No. .....

Town ..... State .....

The ILLINOIS Rockland SPECIAL 50¢ a week

20 Year Case
19 Jewels

THE LATEST CREATION
19 Jewel
Illinois ROCKLAND Special
Known the world over as accurate Railroad Timekeeper
Made by Illinois Watch Co.

Sold with this guarantee. **Money refunded** if any jeweler in the United States can duplicate this watch for less money for Spot Cash.

19 JEWELS, adjusted to positions, heat, cold, isochronism with Double Roller. Guaranteed 20 year case.
SEND FOR CATALOG

$28.50 Cash or Payments

LENOX JEWELRY COMPANY
20 YEARS OF HONEST DEALING
373 WASHINGTON STREET, BOSTON.

Electric Light for Your Home

Uni-Lectric lighting plant generates standard 110-volt direct current; operates from one to 50 lights, electric motor, electric iron, vacuum cleaner, electric toaster, force pump, churn, washing machine, etc.

No Batteries — No Switch-Board

and a **better** machine for **less** money. High speed gasoline motor, generator and automatic governor, all complete in one small, compact unit. Uses standard lamps and fixtures. Simple, easily installed, dependable, economical. Costs less than other systems to buy and to operate.

WATERMAN MOTOR COMPANY
182 Mt. Elliott Ave. DETROIT, MICH.

Write today for full description and low price.

Uni-Lectric
GASOLINE-ELECTRIC UNIT
LIGHTING SYSTEM

Drilling Wells is a Year Round Business

Drilling Water Wells is a profitable, healthful, year-round business. There are wells all around you to be drilled. Don't you want to get into a money-making business for yourself? Write for particulars.

STAR DRILLING MACHINE CO.
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MONEY IN MUSHROOMS

GROW AND SELL MUSHROOMS

An uncrowded occupation. Exceptional opportunities for live men and women. Raised at home. Only small space needed. Small expenditure will start you in a practical money-making enterprise. Big profits. Booklet telling all free. Write
Nat'l Spawn Co., Dept. 12, Boston, Mass.

BIG SPORTING GUIDE AND CATALOG

FREE!

Every lover of outdoors and outdoor sports should have this Guide and Catalog. It is chock full of information. It lists and pictures everything needed in Sporting and Athletic Goods. Many new articles — all quality goods — all bargains.

Making and buying in tremendous quantities and selling direct to you is the secret of the low prices.

Send for this Big Sporting Goods Book now.

Some Sample Bargains

Beverly Tennis Racket, $1.65. Ash frame, walnut throat, strung with oriental gut.

Fielder's Glove, $1.05. Professional model. Welted seams, perspiration proof lining.

Wedge Tent, $3.10. 5x5 feet. Best duck, complete with poles.

Brunswick Jr. Bicycle, $25.65. High grade. Fully guaranteed. Complete with coaster brake, tools, etc.

Fishing Outfit, $2.85. Complete with tackle box, steel or bamboo rod, 60-yard reel, line, sinkers, hooks, etc.

Send for complete catalog today. Free.

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We are miners and shippers of Crude Asbestos in any quantity. We produce all grades at our world-famous Bell Asbestos Mines, in Canada. We also card fibres, spin yarns, weave cloths, and make all sorts of Asbestos products.

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KEASBEY & MATTISON COMPANY
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Owners of the world's largest Asbestos Mines

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Woodcraft Hunting Knife

The biggest value ever offered in a hunting knife. Costs you only $1.50, yet has the shape, weight, quality and desirable features of $2.50 and $3.00 knives. Adapted for sticking, cleaning, skinning, slicing, chopping bone, etc. High-grade steel—bevel blade thick at back, tapering to a fine point. Handle of laminated leather. Absolutely guaranteed. Price $1.50 at your dealer's or direct by mail postpaid upon receipt of price.

Write for catalog Marble's 60 Outing Specialties. Sample Marble's Nitro-Solvent Oil free if dealer's name is mentioned. 131

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That Fly Like Real Ones!

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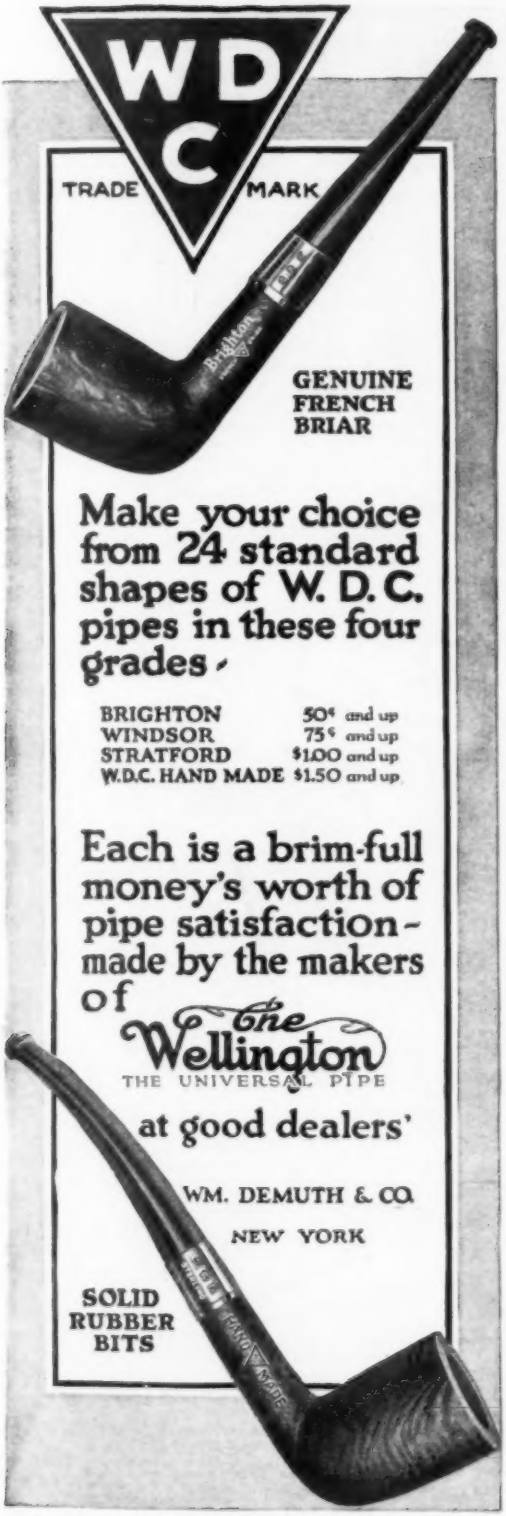

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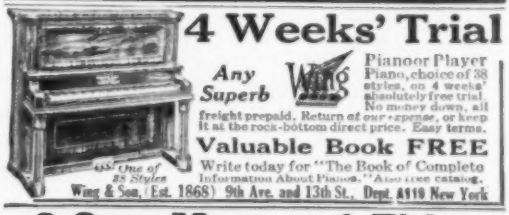

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MORE POWER and ONE-HALF MORE MILEAGE!

Air Friction Carburetors use cheapest grade gasoline or even half gasoline and half coal oil with excellent results. Over 250,000 enthusiastic users!

Start your car instantly and move off at once, while motor is cold (even zero weather), with no "spitting," "popping" or "missing." In other words, end your carburetor troubles.

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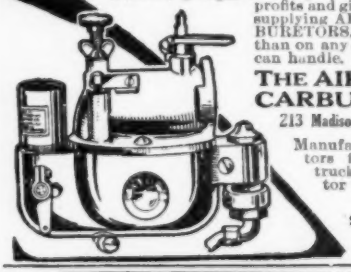

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Manufacturers of carburetors for pleasure cars, trucks, tractors and motor boats.

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Seals punctures instantly—Stops slow leaks. Reduces blowouts to a minimum. Preserves tubes. Increases mileage. Keep tires at normal inflation. Not a filler. 5 years success. Booklet gives details and proof. Write today.

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At Factory Prices—On Approval

NO MONEY IN ADVANCE

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10c DOWN and You keep the watch

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This offer is open to every honest person of legal age in the U. S.

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$ .20 the 2nd week	$ .90 the 9th week	$1.60 the 16th week
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Electric Light for Your Home

Uni-Lectric lighting plant generates standard 110-volt direct current; operates from one to 50 lights, electric motor, electric iron, vacuum cleaner, electric toaster, force pump, churn, washing machine, etc.

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A keener edge than you ever felt. An edge that will flash through the stiffest, wiriest hair. Only a few strokes works marvels on any safety blade. You can't fail to get a lightning edge. You can't misuse a Stag Sharpener. A child can sharpen blades on a Stag as well as an expert. Makes old blades better than new. Makes new blades better.

Complete $1 postpaid to you on this special offer

Stag Sharpener

with barber's hone and strop complete, on our money back guarantee

$1

Protect Yourself

A dull razor is dangerous to health and life itself. The Stag Sharpener is a health protection as well as a positive luxury in shaving. The truest, simplest, quickest, easiest safety blade sharpener on earth.

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HIGHEST AWARD RECEIVED AT PANAMA PACIFIC INTERNATIONAL 1915 EXPOSITION

A Stag Sharpener is the only safety blade sharpener ever awarded the grand prize at an international Exposition.

Positively gives new blades a better shaving edge. Puts the oldest, dullest blades in lightning edge condition. Gives new blades a better edge than when they come from the factory. You can never know the delights of shaving with a positively perfect razor edge, until you sharpen your own blades with the Stag Sharpener. The quickest way. The truest way. The surest way. The safest way. The easiest way. The wheels of the sharpener guide the angle. Nothing to adjust. Nothing to get out of order. Practically lasts a lifetime. Our new patented feature makes the Stag more desirable than ever. Stag Sharpeners are used around the world. The new patented simplified sharpener is more popular than ever. Complete outfit includes heavily nickeled sharpener, barber's hone and strop, in neat box, suitable for traveler's kit. Complete, postpaid to you only $1. Send now.

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Send Today Enclose only $1.00, money order, draft, dollar bill, or check. Send today and make a comfortable shave for yourself. You need a Stag Sharpener. Clip coupon, put in $1 and get it by return mail.

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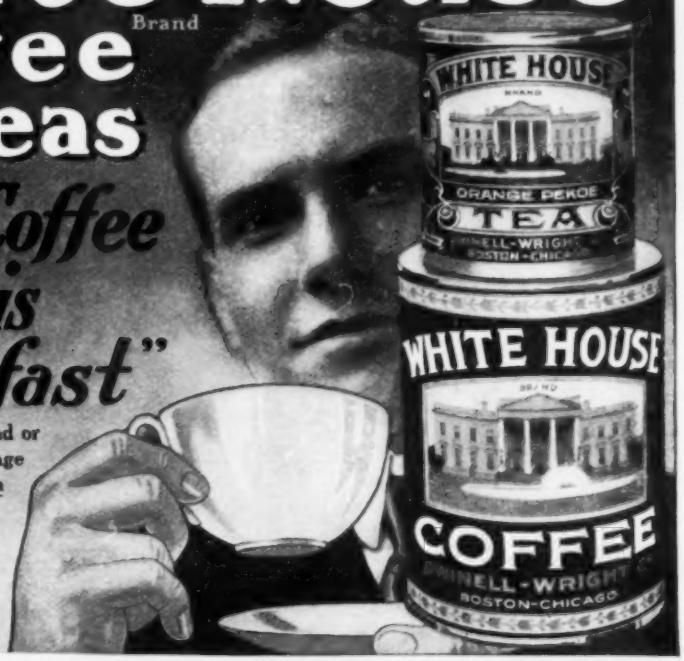
Write to us for special terms to dealers. The Stag is the quickest and best seller on earth. Get the benefit of this advertising and our Dealer Service.

White House Coffee Brand and Teas

"A Man's Coffee is his Breakfast"



Sold in the whole bean, ground or pulverized, never in any package but the 1, 2, 3 or 5-lb. All-Tin cans. White House Tea, ¼ and ½-lb. All-Tin cans, all varieties, as good as White House Coffee.

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Simple little device can be attached by anyone in a few seconds—absolutely burglar proof. Leave windows open, let the fresh air in, keep intruders out. Locks upper and lower sashes, adjustable various heights. All metal. 50 cents apiece, 5 for $2.00. **SENT ON APPROVAL.** Pay if satisfied or return. Write today. Address

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Attached in 10 Minutes

(PATENTS PENDING)

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WE SEND PREPAID AT FOLLOWING PRICES:

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Is your window now broken? Order today.

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Machine-cut direct from Factory AT THE INSIDE PRICE

Home builders can **save money** by dealing direct with the producer. Get around the high cost of building. Dodge the exorbitant prices—compounded profits—extra labor—extravagant waste—and tedious delays of the old-fashioned building method. **Investigate** this newer, better, quicker system.

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Machine-Cut-to-Fit

are the result of **modern efficiency methods** applied to the building business. We will send you **catalog of 100 houses, cottages, bungalows;** make your selection—then we ship complete house direct to you, ready-cut, with all materials complete, at factory price.

Modern Method of Home Building

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An All-around Companion—the Bicycle

A good, dependable, knock-about friend, useful in work, unequalled in sport.

A health builder, a time saver, a convenience and a recreation. Such is the

Columbia Bicycle

Why is it that year after year these bicycles, the first to be made in America, maintain their leadership, and steadily grow in popularity?

The reason is plain: Columbia bicycles have proved themselves—behind them is a service record of thirty-nine years. All that is best and most progressive in bicycle construction is found on them.

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To attain these ends there is nothing more ideally adapted to the needs of man than the bicycle. And the bicycle is yet to be made that can serve these needs more satisfactorily and dependably than the Columbia.

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Everybody wants to chum with the boy who owns a King. But every boy ought to have one of his own, for Drilling, Scouting, Camping Out, Target Shooting and all 'round fun.

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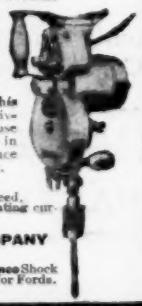
"Our foreman reports it the best electric drill he has tried."

Any way, it's a mighty good tool. It works fast and does much besides drilling in metal and wood. It also **Taps threads, drives and draws screws, grinds valves, and sharpens small tools.**



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5 sizes weighing 9 to 19 pounds

Capacities to ½ inch drilling in steel. One and two speed, and instant motor reverse types—direct or alternating current. From dealers and jobbers, or direct

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If you are racking your brains to think of a suitable birthday present—*stop.* Go to any dealer and ask to see Ingersoll watches. There are eleven kinds from a $1 to $3.

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are world famous. Own a Cornet, Trombone, Clarionet, Drum, Saxophone, Violin, Guitar—any Band or Stringed Instrument. **PLAY WHILE YOU PAY** a little a day on the **Jenkins Plan. SAVE BIG MONEY. FREE Lesson Certificate** with each instrument.

FREE Complete Cornet and Violin parts from **Jenkins' Beginners' Band Book** and **Instructor** and **Jenkins' Beginners' Orchestra Book** and **Instructor.** All instructions to start and make a new band or orchestra. A big success. Easy to play pieces for a starter. Band instrument parts, each 25c; orchestra, 50c; piano, $1.00. Jenkins' instruments and music stock the largest and best in the country.

CATALOG Write for big Catalog of instruments and latest music lists. **A test will prove us best.** Address

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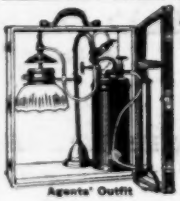
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for our independent hollow-wire lighting system for homes, stores, public buildings, etc. Use common gasoline. Best and cheapest illumination known.

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are most improved, simplest and **safest of all.** Shed a clear, soft, bright light of high candle power. Also complete line of portable and street lamps and lanterns. Fully guaranteed. Our Agency Proposition cannot be beat. Exclusive territory. Send quick for catalog and terms.

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NEW INVENTION—**just out.** Needed in every home every day. Patent just applied for. Nothing else like it. Supplies what every housewife has wished for for years. Perfected after long experimental work by mechanical experts. Low priced—anyone can use it—**sells on sight.** We want three hundred representatives at once—men or women hustlers—to advertise, accept orders and manage deliveries for our new **Quickedge Knife and Shear Sharpener.** Sharpens any kitchen knife, paring knife, carving knife, bread knife or shears and scissors **in ten seconds.** Agents are taking orders at every house—**wiring for rush shipments.** Write today for this opportunity to make $10 to $20 every day.

MAKE $300 NEXT MONTH

This little machine is a mechanical masterpiece. A child can use it. Just put knife in slot—turn crank—**grinds automatically**—draws blade to keen, sharp, perfect, lasting edge **at absolutely correct bevel for daily use.** Nothing to adjust—nothing to change, nothing to get out of order—**absolutely guaranteed**—will last for years. Once they see it and use it, women will not do without it for several times its cost. One agent wrote: "It was easier for me to learn to sell the **Quickedge** than it was to learn to tear open my pay-envelope in my former dollar-a-day job." Get out of the dollar-a-day class. Get this position, where profits start the first day.

No Experience Required

Just take one of the machines to any house and show it—give a ten-second demonstration upon the dullest knife in the house; **the order is yours right on the spot; instantly.** No talking necessary. No argument. The machine simply sells itself, **and stays sold.** Every customer becomes your friend. They tell others, your profits double and multiply. Leave one hundred on trial over night. Collect the cash for every one of them next day. **The machine will do its own talking;** it is so easy to operate, no explanations or instructions are necessary. Secure your county now; **free.** Get started right now and

Only $1.50 Selling Price

Low price, ease of operation, astonishing quickness and absolute perfection of results, money-back guaranty. These things make the **Quickedge** the fastest seller of the age—**the biggest money-maker for agents, general agents and managers ever invented.**

Make $70 Next Week

Easy to start—easy to make big money if you will just follow instructions and work faithfully. **No charge for territory. 200% profit for agents.** Business supplies capital. Exclusive protection, co-operation and assistance. Failure impossible. Nothing to risk. Success assured.

Easy to demonstrate—and every woman is anxious to see it work—then she would not do without it. No talking necessary. Just show the machine and take the order—**one dollar profit on every call you make.**

Send for application blank and complete information today—**free.** Investigate. **Get the proof.** Don't delay. Write a postal card or letter right now. **Territory is being assigned very fast.** Get your county now—**free.** Write today.

The Quickedge Knife and Shear Sharpener

Grinds any Kitchen Knife or Shears in 10 Seconds

Absolutely Guaranteed

Make as Much Money Next Week as These Men are Making Now

J. C. Lewis, of Kansas, says: **"I have sold one hundred Sharpeners in four days."** Hobart Kerr, of Md., writes: "The women can hardly wait till they get them." Herbert Cain, of Ky., sold nine after supper. At the end of his first day, J. W. Gordon, of Pa., writes: "I sold two dozen, and **I sold to every one I saw."** Wm. G. Hall, of N. J., says: "I think it is great. I sold six in about one-half hour. The machine is a mighty fine proposition. **I am a mechanic and I know what I am talking about."** Peter Courtland, of Mich., writes: "I received your sharpener and opened it in a barber shop. I ground his shears and I got an order for one right on the spot." H. A. Henkel, of Va., says: "I have examined it and find it a wonderful little machine. **The workmanship is simply perfect."** Frank King, Colo., says: "Sample received Saturday. Sold ten today. Sell to most every house." Forest Webb, of Pa., says: "Went out Monday afternoon for about three hours and received one dozen orders. **Profit $12.00."** H. Tillery, of Tenn., wrote: "I took three orders first hour. When you sharpen an old, dull knife, dull as a hoe, in less than a minute, **they sit up and look."** Ray Carter, of Mass., writes: "I went out two days and have orders for thirty sharpeners." **Profit $30.00 for first two days.** John Durr, of Wis., also says: **"I have sold thirty in two days."**

You can make this money. **Send now.** Territory free.

GET BUSY. WRITE TODAY.

The Quickedge Sharpener Company
No. 664 Sharpener Building
215 N. Desplaines St., Chicago, Ill.

BERNARD-HEWITT & CO.,
Desk F23, 424-434 So. Green St.,
CHICAGO, ILL.

Please send me your new Spring style book with 70 samples free — also full details of your special lining offer.

Name .....

Address .....

.....

MAIL COUPON

For Spring and Summer
STYLE BOOK

70 SAMPLES FREE

Handsome $25 Blue Serge Suit Made to Measure only $15

WE PAY SHIPPING CHARGES

A SPECIAL proposition to introduce the wonderful values offered by our system of tailoring. We have no agents — no dealers — no traveling salesmen — our values make their own customers — and once a Bernard-Hewitt customer always a Bernard-Hewitt customer. That's why, to secure your first order, we are willing to make to your individual measure, a handsome, all pure wool worsted blue serge suit (usual $25 value) for only $15 and line it with a

$4 SATIN LINING FREE

Remember this suit is made to your individual measure from the very finest all wool blue, light blue, black or gray serge, in the latest approved Chicago style, and by the very best tailors in this whole city.

But perhaps you don't care for a serge suit. Well, our big book which we will send you free contains generous samples of the latest fabrics; plain and fancy mixtures, the up-to-the-minute offering of leading woolen mills.

The $4.00 Satin Lining free offer goes no matter what selection you make—and we pay all shipping charges. We take all the risk—you none—for this is

OUR GUARANTEE You Don't Pay Us One Cent

Unless you are more than pleased in every particular in fit —in style—in workmanship and in materials. Could anything be fairer? Write today — wear real tailor-made clothes — dress better and save money.

Take Your Own Measure—Save $10

Write for Your Copy of Our Big Book Today

Our big new Spring and Summer book is ready for you — contains 70 samples latest woolens — also lowest prices on men's hats, shoes and furnishings. It is your guide to correct and economical clothes buying. Mail coupon above or send post card for your copy. Please mention POPULAR MECHANICS so that we can identify this special offer.

BERNARD-HEWITT & COMPANY

424-434 So. Green St. Desk F23 CHICAGO, ILLINOIS

Much Depends on the Rear Tire

THE rear tire gets all the strain of starting and stopping, all the traction, most of the slewing and slipping, most of the weight and sometimes all the weight of an extra passenger.

Firestone

MOTORCYCLE TIRES

are designed and constructed as if they were all to be used as rear tires, that is they are built to resist the greatest strains, the emergency strains.

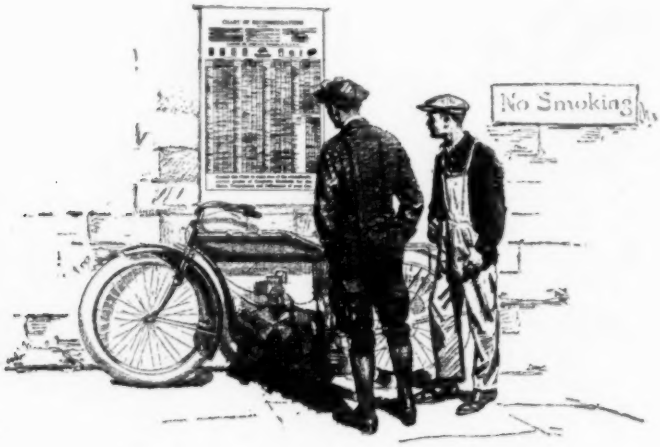
Extra fabric, extra rubber, 30 per cent more angles against skid, mean to you more confidence, more safety, more comfort, and to your mount greater efficiency, speed, and road grip, less skidding, slipping and vibration.

These leading manufacturers furnish Firestone Tires on their machines without extra charge.

Cleveland	Henderson
Dayton	Schickel Indian
Emblem	Reading Standard
Excelsior	Smith Motor Wheel
Harley-Davidson	Thor

See your dealer.

FIRESTONE TIRE AND RUBBER COMPANY
AKRON, OHIO Branches and Dealers Everywhere



MOTORCYCLISTS

Make this Chart your guide

Look for it on your dealer's wall

YOUR Oil runs low. You stop for a fresh supply.

You now come to a vital question. What oil will the dealer supply you? Will it be just "oil"—or will it be the correct lubricant for *your* engine?

Among thousands of dealers this is what happens:

The dealer asks the make of your motorcycle. He runs his finger down the Vacuum Oil Company's Chart (shown above in miniature) until he finds your motorcycle's make and model. Then he supplies you with the grade of Gargoyle Mobiloils specified for your motorcycle by the Chart. This oil will effectively seal your piston rings against power-waste, gasoline-waste and oil-waste.

Why are thousands of dealers placing such reliance in this Chart?

Experience has taught them that something like 50% of all engine troubles are due to incorrect lubrication.

They realize that scientific lubrication is a problem for specialists. Since the dealer has neither time nor equipment for studying this intricate subject he draws on the experience of a recognized authority.

That is why you find on his walls the large Chart of Recommendations, issued by the Vacuum Oil Company.

If you inquire about the Chart you will find this:

The Vacuum Oil Company for 50 years have specialized in scientific lubrication. Today their world-wide leadership in lubrication matters is unquestioned in scientific circles.

For years their Chart of Recommendations has been recognized as the only standard guide to correct automobile and motorcycle lubrication.

In keeping this Chart up to date, each new model of every motorcycle is carefully analyzed. This work involves lengthy and painstaking engineering study by the Vacuum Oil Company's Board of Engineers. The recommendations of this Chart are proven correct by repeated practical tests.

But nothing has given dealers such faith in this chart as their experience with the oils themselves. For no one knows better than the dealer how difficult it is to secure efficient lubrication—and how much efficient lubrication means.

Write for new 56-page booklet containing complete discussion of your lubrication problems, list of troubles with remedies and complete Charts of Recommendations for Automobiles, Motorcycles, Tractors and Marine Engines.

GARGOYLE

Mobiloils

A grade for each type of motor

In buying Gargoyle Mobiloils from your dealer, it is safest to purchase in original packages. Look for the red Gargoyle on the container. If the dealer has not the grade specified for your motorcycle, kindly write our nearest branch, giving dealer's name and address.

VACUUM OIL COMPANY

Rochester, N. Y., U. S. A.

Specialists in the manufacture of high-grade lubricants for every class of machinery. Obtainable everywhere in the world.

Domestic Branches:

Detroit New York Philadelphia Minneapolis Boston Chicago Indianapolis Pittsburgh Kansas City, Kan. Des Moines

Correct Motorcycle Lubrication

Explanation: The four grades of Gargoyle Mobiloils for engine lubrication, purified to remove free carbon, are:

Gargoyle Mobiloil "A"
Gargoyle Mobiloil "B"
Gargoyle Mobiloil "E"
Gargoyle Mobiloil "Arctic"

In the Chart below, the letter opposite the motorcycle indicates the grade of Gargoyle Mobiloils that should be used. For example, "A" means "Gargoyle Mobiloil A," "Arc" means "Gargoyle Mobiloil Arctic," etc. For all motorcycle transmissions use Gargoyle Mobiloil "C." The recommendations cover all models of the same make, unless otherwise noted.

MODEL OF	1917		1916		1915		1914		1913	
MOTORCYCLES	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
A. M. C.			B	A	B	A	B	A	B	A
American							B	A	B	A
Amer. Peugeot (2 cyl.)							B	A	B	A
" " (4 cyl.)									A	Arc.
Arrow									B	A
Autoped	B	B	B	A						
Auto Tri									B	A
Bailey Flyer							B	A	B	A
Black Hawk									B	A
Cleveland	B	B	B	B						
Crawford							B	A		
Curtiss							B	A	B	A
Cyclemotor	B	B	B	B						
Cyclone					B	A				
Dayton	B	A	B	A	B	A	B	A	B	A
De Luxe (1 cyl.)									B	A
" " (2 cyl.)			B	A	B	A	B	A	A	Arc.
Eagle			B	A	B	A	B	A	B	A
Emblem (1 cyl.)			B	A	B	A			B	B
" (2 cyl.)	B	A	B	A	B	A	B	A	B	A
Excelsior	A	A	A	A	A	A	B	A	B	A
" " (Lightweight)	B	B	B	B						
Feilbach									A	Arc.
Flanders					B	A	B	A	B	A
F. N.									A	Arc.
Geer									B	A
Greyhound									B	A
Harley-Davidson	B	A	B	A	A	Arc.	A	Arc.	A	Arc.
Henderson	A	A	A	A	A	Arc.	A	Arc.	A	Arc.
Indian (1 cyl.)			B	B	B	A	B	A	B	B
" (2 cyl.)	B	A	B	A	B	A	B	A	B	A
Iver Johnson	B	A	B	A	B	A	B	A	B	A
Jefferson							B	A	B	A
Limited							A	Arc.		
Majestic									B	A
Marvel									B	B
Maxim Tricar							B	A		
Merkel	B	A	B	A	B	A	B	A	B	A
Miami (Power Bicycle)	B	A	B	A						
Michaelson					B	A	B	A	B	A
Militaire			A	A						
Minneapolis									B	A
M. M.									B	A
Monarch					B	A	B	A	B	A
Motorette					E	E	E	E	E	E
New Era									B	A
New Hudson									B	B
N. S. U. (1 cyl.)									B	B
" " " (2 cyl.)									A	Arc.
Okay	B	B								
P. E. M.									B	A
Peugeot									B	A
Pierce (1 cyl.)							B	A	B	A
" (4 cyl.)							A	Arc.	A	Arc.
Pirate							B	A	B	B
Pope	B	A	B	A	B	A	B	A	B	A
Reading Standard	B	A	B	A	B	A	B	A	B	A
Reliance									B	A
Schickel	B	A	B	A	B	A	B	B	A	Arc.
Scout									B	B
Shaw			B	A	B	A	B	A	B	A
Smith (Motor Wheel)	A	A	A	A	A	A				
Theim							B	A	B	A
Thor (1 cyl.)	B	A	B	A	B	A	B	A	B	B
" (2 cyl.)	B	A	B	A	B	A	B	A	B	A
Tiger Autobike			B	B						
Wagner			B	A	B	A	B	A	B	A
Yale (1 cyl.)					B	A	B	A	B	B
" (2 cyl.)					B	A	B	A	B	A

Outfit No. 36

Latest model concealed horn instrument, finished in beautiful f a m e d oak—elegantly polished. 12 3-8 in. high, 12 1-2 in. wide, 16 in. long. Price, with 12 Blue Amberol Records, only **$36.00.** (See terms in the coupon on opposite page)

Your Choice Sent on Free Trial

See Coupon on Opposite Page

AN astounding offer—your choice of these three outfits of the New Edison, Mr. Edison's great new phonograph with the new Diamond Stylus reproducer, and twelve brand new Blue Amberol Indestructible Records sent to you on *absolutely free trial.*

Send no money—just fill out the coupon on opposite page. Send it at once. We will send you the complete outfit which you choose immediately. Entertain your family and friends with the latest song hits of the big cities. Laugh at the side-splitting minstrel shows. Hear anything from Grand Opera to Comic Vaudeville. Then, if you choose, send the whole outfit back to us *at our expense.*

Only $1.00 After Trial

If you wish to keep Mr. Edison's superb new instrument after the free trial, send us only $1.00. Pay the balance for the complete outfit in small monthly payments. (See terms in coupon on opposite page.)

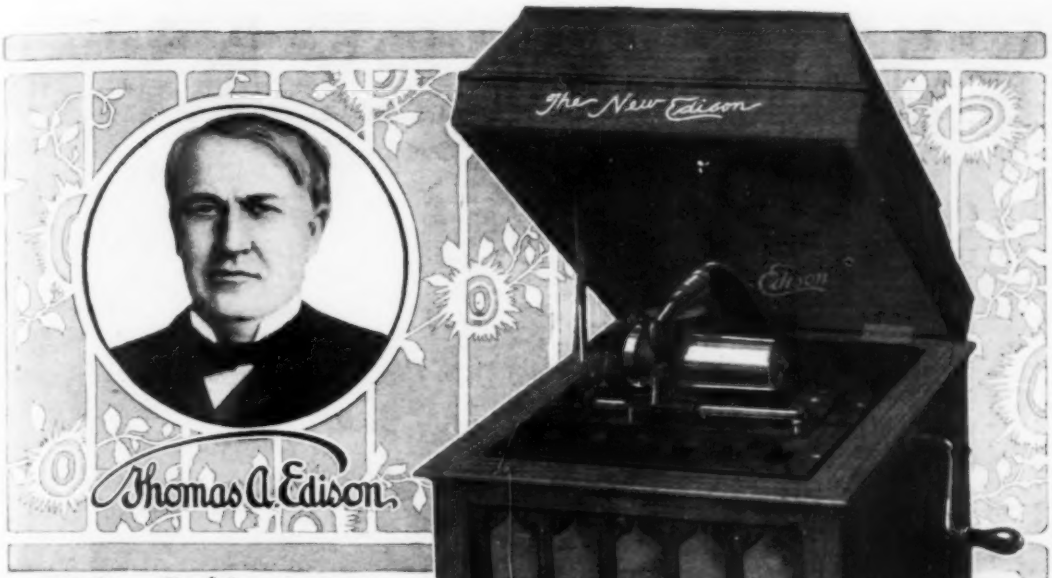
Think of it—a $1.00 payment, and a few dollars a month to get an outfit of Mr. Edison's new phonograph with the Diamond Stylus reproducer, the life-like music—the wonderful Blue Amberol Records. The *finest*, the *best* that money can buy at very much less than the price at which imitations of the Genuine New Edison are offered.

After years of labor on his favorite invention, Mr. Edison has made the music of the phonograph true to life. There is no reason, now—especially since we make this rock-bottom offer—why you should be satisfied with anything less than Mr. Edison's genuine instrument.

Send This Coupon TODAY!

Special Offer
On This Great Outfit

Outfit No. 475 New Model Instrument and handsome record cabinet complete—two pieces. An entire phonograph outfit, just like the very highest priced instruments *and at one-fifth the price!* Cabinet finished in dull brown fumed oak. Capacity 80 records. Height of outfit complete 42 3-4 in., width 14 1-4 in., length 17 1-2 in. Price, complete, with 12 Blue Amberol Records, only **$47.50.** (See terms in coupon on opp. page.)



Mr. Edison's Wonderful New Phonograph

Send No Money—Just This Coupon

Outfit No. 56

A superb instrument; wonderful bargain. Handsomely plated and polished. Richly enameled. Size 15 1-4 inches high, 14 7-8 inches wide, 19 5-8 inches long. Regularly finished in mahogany and golden oak. May be had also in weathered oak or fumed oak. Price, with 12 Blue Amberol Records, **$56.00.** (See terms in coupon below.)

Convince yourself first. Get the New Edison in your home on free trial. See for yourself how much happier it will make your home. Just fill out the coupon and send it in. No money down, no C. O. D. You pay us nothing on the instrument or records unless you decide to keep the outfit. Send it back if you wish **at our expense.** Or pay only $1 after the trial, and balance in easy monthly payments as explained below. Send the coupon now.

F. K. BABSON, Edison Phonograph Distributors, 1193 Edison Block, Chicago, Ill.

Canadian Office: 355 Portage Avenue, Winnipeg, Manitoba

No obligation to buy in sending this coupon; this is just an application for a Free Trial

F. K. BABSON, Edison Phonograph Dists., 1193 Edison Block, Chicago, Ill.

Dear Mr. Babson:—As per your offer, I should like to hear Mr. Edison's wonderful new style phonograph with the new Diamond Stylus reproducer in my own home on free trial. Send me the outfit which I have checked below, including the twelve Blue Amberol records. If I decide to keep the outfit, I will have the privilege of the rock-bottom price direct from you on your special terms. I agree merely to take the outfit promptly from the depot, pay the small freight or express charges, and if I do not find it thoroughly satisfactory, I reserve the right to return the outfit at once at your expense. Otherwise, I will send the first payment of $1.00 within forty-eight hours after the free trial or as soon as possible, in no case exceeding one week, and make monthly payments thereafter of (*Check the square below to the left of the outfit which you wish to have us ship*).

☐ **Outfit No. 36** $3.50 for 10 months. Complete price $36.00.

☐ **Outfit No. 475** $4.50 for 10 months, $1.50 for 11th month. Complete price $47.50.

☐ **Outfit No. 56** $5.50 for 10 months. Complete price $56.00. Send me the outfit finished in .....mahogany.....golden oak.....weathered oak.....fumed oak

The outfit is to remain your property until the last payment has been made.

My name..... My post office..... State.....

Shipping Point.....Ship by..... Occupation.....

Age.....Married or single.....If steadily employed at a salary please state.....

How long a resident in your neighborhood and your vicinity?..... If there is any possibility of changing your address during the next year, what will be your next address?.....

Please Mention Popular Mechanics

BLUE STREAKS

$3.00 each

Guaranteed

That bicycle you used to ride—is it rusty and dusty in your garret or woodshed?

Bring it back again into service with Goodyear Blue Streak Tires. Get it out! For Blue Streaks have met that bicycle tire bugaboo.

You may now buy really dependable tires—Goodyear Blue Streaks—everywhere. Tires that let you forget that former high cost of bicycle upkeep.

Goodyear has done that for bicycle folk by making only one bicycle tire, and making that one tire really good. Blue Streaks hold fast to a high quality standard. And, they're packed with happy, healthy miles that make your heart glad.

Even with material prices as high as they are today Blue Streaks cost only $3.00.

Blue Streaks are standard everywhere.
One quality, one guaranty, one price.
At any Goodyear Dealer's.

The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR
AKRON

After Meals—*Billiards!*

Of all the hours in the day the "Billiard Hour" is best. Then fathers and mothers gather with their happy brood around the Brunswick Carom or Pocket Table, now the life of thousands of homes.

Dull care vanishes when Billiards starts, and sport is King till bed time comes.

For parties, holidays and leisure hours—for health and happiness—*your home needs billiards!*

BRUNSWICK
HOME BILLIARD TABLES

Live cushions, true angles, fast ever-level bed—on Brunswick Tables your skill will triumph most.

A Size for Every Home

"Quick Demountables" can be set up easily anywhere and folded away in a closet when not in use.

"Baby Grand" and "Regulation Grand" for homes with space to spare for a table.

Beautifully built of mahogany and oak. Cues, Balls, Markers, etc.—complete playing outfit included *free!*

Write for Color-Catalog

Low prices, easy terms and home trial offer all explained in our handsome billiard book and catalog—"Billiards—The Home Magnet."

Get this book by return mail free. Send today.

The Brunswick-Balke-Collender Co.
Dept. 46L 623-633 S. Wabash Ave. Chicago

Send Your Address For Catalog

The Brunswick-Balke-Collender Co.
Dept. 46L, 623-633 S. Wabash Ave., Chicago

Send free, postpaid, a copy of your billiard book and color catalog—**"BILLIARDS—THE HOME MAGNET"** and tell about your home trial offer.

Name .....

Address .....

.....

If Your Bathroom is Modern so is Your Home

No More Cold Bathrooms

Nothing makes home more inviting or more healthful during the cold winter months than warm, toasty, even heat. Keeps everybody healthy and happy.

Install One of Our Heating Plants—Cut to Fit

No loss or waste — hot water, steam, or air. Send for our free estimate. We can save you ½. We furnish simplified installing plans, specifications, and instructions, and lend you the tools. Any handy man can do the installing the new Hardin Easy Way.

Mail Coupon for Free "HANDY-MAN" Book

Every House Owner, Factory, Hospital, Hotel, Office Building, Farmer, Engineer, and Mechanic needs one. It shows a complete line of all the Latest Improvements and Different Designs in Guaranteed heating and plumbing outfits, water supply systems, sinks, roughing-in-goods, pipe, fittings, valves, etc., and all parts and repairs at Wholesale Prices. It also contains practical and exclusive information on How to Do Your Own Plumbing and Heating our new **Hardin Easy Way.**

Our Engineers Will Help You Plan and Install

Draw a rough sketch of your plan for any heating or plumbing installation, and our staff of engineers will show you the easiest, cheapest way, and supply easy installing plans absolutely free to YOU. Any handy man can do the work with the help of our engineers and save all plumbing bills. We make all shipments promptly, direct from our nearest factory.

BONDED GUARANTEE

Our guarantee label appears on every fixture we ship. It is your assurance of a square deal. We will replace, without cost to you, any fixture or part that proves defective or not as represented. We **guarantee** satisfaction. Everything we sell is grade A. "Highest Quality at Wholesale Price" is our motto.

P. M. MAR.

FREE "Handy-Man" BOOK COUPON

The Hardin-Lavin Co.
4540-50B Cottage Grove Ave., Chicago

Please send me your **"Handy-Man"** Free Book showing everything in plumbing and heating supplies at lowest wholesale prices.

Name

.....

Address

.....

SIGN, TEAR OFF AND MAIL

Hardin-Lavin Co.

Buy Direct—Save One-Half

Remember, everything we sell is Grade A. Highest Quality Guaranteed Goods at prices that will surprise you. You save not only on the cost of the goods but on the cost of labor. Our practical experience of 40 years enables us to furnish heating plants with new, original features, combining quality, economy, simplicity, easy installing, and lasting durability.

"Handy-Man" Free Book

This book has been written for the handy man about the home. Aside from being our Catalogue, it contains many pages of practical information and money-saving suggestions pertaining to home improvements. It's worth a dollar of any man's money, but, if you are interested in up-to-date plumbing and heating goods, we send it FREE. Send for this valuable book and learn how to buy all plumbing and heating supplies on a time-saving, labor-saving, money-saving basis.

Immediate Delivery This is as much a part of our special service as our guaranteed quality or wholesale prices.

40 Years in Business at the same address is a record to be proud of. It speaks volumes for our wholesale price policy and money-back guarantee. Send for free **"Handy-Man"** Book and full particulars. **$500,000 plants behind our guarantee.**

The Hardin-Lavin Co.
40 Years at 4540-50B Cottage Grove Ave.
CHICAGO

Why Slave for Wages Now?

MONEY CALLS YOU HERE

—Answer and be Happy

This Puts New Joy Into Living for Men or Women

We can tell you the names of hundreds of men and women, representing us, who are now proud to write us of the cash profits they are making like the following:

"Bought an Automobile"
—writes a young man from Texas in December.

"Paid for My Home"
—wrote a good, ambitious woman from Pennsylvania in October.

"First Life Success"
—wrote a man of forty-five whose previous business had failed to make him money.

"Paid College Course"
—says a young man now well equipped with this special business all his own, representing us.

We Tell You How

Everything is made plain and simple and easy for you to start at once. If you are the right person for this opportunity there is no reason why you should not be just as successful as hundreds of others are being.

Please do not fail to investigate and find out.

If this were not a fine, clean-cut and independent line of money-making work we would not offer it to you. This may be truly the very best offer and opportunity of your lifetime. It certainly costs you nothing to find out. Our reputation and standing in the commercial world is behind this offer.

Write Today

What You Have Wished

$ DOLLARS in cash, bringing plenty and regular income, may now be yours very easily, on part time or all of your time, if you accept this wonderful opportunity. You, like hundreds of others, young or old, men and women, may this way gratify

The Ambition to Play You can be your own boss. Stop slaving long hours for wages. Divide your hours of recreation and work to suit your own good judgment on when and where to go after immediate cash profits that are waiting for you.

The "Big Joys" of Life A limited number of opportunities to represent one of the largest concerns in America and be independent on the increasing profits from your work should allow you to now begin to get some of the "Big Joys" of living.

Live Anywhere—Go Anywhere Stay where you are, or travel as you please. Wherever you are or go, we tell you from the start just how and where the biggest money-making possibilities can easily be found.

Start At Once Our new 1917 special proposition is yours for the asking. If you are not the right man or the right woman to be successful we will tell you so when you tell us about yourself and your wishes after you get our splendid proposition—sent at once postpaid, free, no matter where you live.

No Experience Needed Please do not get the idea that we want experts. We would rather have good, live, honest men or women with ambition to better themselves and be absolutely independent, than to make this offer to ordinary so-called "experts" without imagination or push in their systems. **Write today.**

FREE

Oliver Millions Back You

THE OLIVER TYPEWRITER COMPANY
Dept. 1407, Oliver Typewriter Building, Chicago, Ill.

Send No Money

Special Attention: Dept. 1407. Please send me your **special 1917 offer,** telling complete facts on how I may represent you and how others are making good independent incomes this way in cities, towns and rural communities.

NAME .....

ADDRESS .....

TOWN ..... STATE .....

TEAR OUT AND MAIL NOW FOR COMPLETE OFFER—FREE

W. F. HALL PRINTING COMPANY, CHICAGO

Fascinating Book of Human Interest Free

A book for every home. A book for every man, woman, and child. A book that reveals the most remarkable achievement in the fascinating field of scientific discovery for the home and for human happiness. A story of intense interest and gripping power. It is a book of instruction to be read, remembered, and kept for reference. It should be in your hands. Everyone should know what the Violet Ray is and what it will do. We will give away this entire edition of the book free. Send coupon or your name on a postcard and get it free.

One of many uses of Violet Ray At the University of Chicago and Union League Club.

VIOLET RAYS AT "U" TANK TO ROUT GERMS

Violet Rays will purify the waters of the Ida Noyes natatorium, the girls' swimming tank at the University of Chicago after this. One of the three large Violet Ray purifying machines in the country is being installed there. One of the others is in the far west and the third is in the tank at the Union League Club, Chicago. As the water flows into the tank the Violet Rays will kill the germs in it.—*Chicago Tribune.*

The greatest value of the Violet Ray is in the home and for personal use. The small Virayo, the new perfected Violet Ray machine has hundreds of uses in the home for every member of the family as told in the booklet Virayo.

Charming Story of the Marvelous Violet Ray

Truth is indeed stranger than fiction. The true story of the Violet Ray is a revelation of the result of secret labors that have gone on in the world-famous laboratories for 46 years. The scientific world stood in awe when the brilliant colors of the Violet Ray were shown for the first time, leaping out of a glass vacuum and **penetrating the human body with a refreshing sensation never known before.** It purified air and water. It created ozone. It penetrated every substance and destroyed germs and bacteria everywhere. How to use this new, wondrous influence for the benefit of humanity? This was the task the scientists set before themselves. After 46 years of labor and research the story of their wonderful discoveries is now charmingly told in the book Virayo by a fellow scientist. You will understand the importance of this book when we quote one sentence from one of the world's greatest electrical masters. He said: "*The Violet Ray is the kindest gift of nature that science has conferred upon humanity.*"

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